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BRIEFLY TOLD.

EMPLOYEES' MEETING AT NEW HAVEN, CONN.—The New Haven (Conn.) Gas Light Company is practicing in an unheralded but most effective manner all of the preachments of the New Business *Engineers*, the result being of lasting benefit to the residents of that beautiful city. The new show room, next door to their handsome offices, has been fitted up with an eye to attractiveness rather than utility, for not quite as many fixtures and appliances may be seen here as in many display rooms half its size. It is too well known to need comment that, largely through the efforts of President Nettleton, the employees are stockholders in the Company, and from the meetings which they hold it would seem that they take an active interest in its affairs. At the last meeting, held on the 19th inst., Mr. A. R. Burr, who handles the sales' end, arranged the first of a series of lectures to the employees on the use of gas burning appliances. By invitation of the Company, Mr. H. Thurston Owens, of New York city, delivered a lecture on street lighting, illustrated by slides, showing the apparatus used in the principal cities of this country and Europe, many of which have appeared in previous issues of the JOURNAL. The discussion which followed covered the various applications of gas burners for interior as well as exterior illumination. The lecture was an appropriate one in one sense, as the Company intends to light the street upon which their office is located with gas arcs supported upon posts which will be the envy of their competitors.

MARCH MEETING, NEW YORK SECTION, ILLUMINATING ENGINEERING SOCIETY.—The subject of color was discussed at the regular monthly meeting of the New York Section of the Illuminating Engineering Society, held on the evening of the 17th inst., at the United Engineering Society Building. Three papers were presented and the Chairman, Dr. E. P. Hyde, requested Mr. A. J. Marshall to read the first, entitled "The Relationship of Decoration to the Illuminating Engineering Practice," by Mr. C. R. Clifford, as the author was unable to be present. The theme is a broad one and the possibilities rather than the practice were dwelt upon. The second paper, entitled "Luminous Efficiency," by Mr. H. E. Ives, was read by the author, and proved to have much of value, as was to be expected of Mr. Ives. The work of a number of investigators has been summed up and made ready for practical use by those interested. The last paper was read by Mr. D. McFarlan Moore, the inventor of the Moore Tube, on the subject of "A Standard for Color Values," and covered the various applications of this light source, most of which were well chosen. One, however, cannot bear scrutiny—a photograph gallery and art store on Fifth avenue, New York city, where the Moore tube is used to attract the eye of the passerby, while the goods are displayed by the light of gas arc lamps! Mr. Basset Jones opened the discussion making a plea for the necessity of proper lighting in order to bring out the architectural details of interiors successfully, being followed by Prof. E. L. Elliott, who called attention to the desirability of having a standard white light, stating that no one seemed to agree as to what constituted average daylight. He then moved that the New York Section request the Council to take steps towards having some standard defined and accepted, which was seconded and passed apparently without a dissenting vote. After further discussion by Messrs. Macbeth, Auerbacher and Ryan, the meeting adjourned.

CURRENT MENTION.—

MR. CHAS. M. COHN, well known for his efficient work in the commercial end of the Baltimore (Md.) Consolidated Gas, Electric Light and Power Company, has been promoted from the post of Secretary, which he has held for the past four years, to that of Vice-President and General Manager. He has been in charge since Mr. A. S. Miller resigned. Mr. Cohn is a native of Baltimore and a member of the bar. His successor as Secretary is Mr. Wm. Schmidt, Jr., formerly Auditor for the Company.

MR. FRANK L. CROSS has been appointed General Manager of the Madison (Wis.) Gas and Electric Company, succeeding Mr. John Corscott, who becomes Vice-President. Mr. Cross has been connected with the Detroit City (Mich.) Gas Company for the past 8 years.

MR. CHAS. D. ARMSTRONG has been selected by General Manager Slade to handle the commercial department of the New Orleans Railway and Light Company. Mr. Armstrong comes from the Montgomery (Ala.) Light and Water Company.

MR. JOHN A. MYLER, Manager of the Union Gas and Electric Company, of Bloomington, Ills., has resigned.

MR. COE BRANCH has been appointed Manager of the Canon City (Col.) Gas Company.

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THE Atlanta (Ga.) Gas Light Company is about to install a large number of gas arc lamps upon handsome ornamental posts upon the streets adjoining its office building.

MESSRS. W. L. BAILIE, W. L. Lamredin and Garland Peed, of Norfolk, have obtained a franchise to manufacture and distribute gas for light, heat and power for public and private use, and right to operate a gas plant in Wilson, N. C. The franchise is for a term of 30 years.

F. C. CRARER, New Business Manager with the Dover, Rockaway and Port Oram Gas Company, at Dover, N. J., has accepted a position with the Syracuse Lighting Company, of Syracuse, N. Y., taking charge of their Maintenance Department.

MR. JOHN A. BRITTON, Secretary of the Pacific Coast Gas Associaciation, has issued a most alluring invitation to be present at their 18th annual meeting, to be held in Los Angeles on September 20th. Their slogan is "Los Angeles or bust."

THE 6th annual convention of the Southwestern Electrical and Gas Association will be held in Beaumont, Tex., May 12, 13 and 14, 1910.

MOST interesting are the figures that have so far been compiled by Commissioner J. C. A. Hillen, many of which are given in the advance information sheets from that excellent volume known as the "Red Book" of the Bureau of Labor Statistics, State of Missouri, respecting the gas output of "Show M," Missouri, for the year ended December 31, 1909. The figures show that in 1909 the consumption of manufactured and natural gas amounted to 18,350 millions cubic feet, which compares with an output for the preceding year of 18,244 millions cubic feet. The value of this sendout or use in 1909 (including prices secured for residuals, such as coke, tar and ammonia) was $7,216,788, and the value of the stock on hand January 1, 1909, was $279,621. In the 1909 "Red Book of the Labor Bureau"—the Supervising Statistician to whom the main credit for this great compilation is due is Mr. A. T. Edmonston—showed that the consumption of manufactured gas in Missouri for the year 1909 was 4,380 millions valued at $4,236,000, and of natural gas 13,600 millions cubic feet, valued at $2,483,587. While the consumption of natural gas is about 3 times as great as that of the artificial sort, the total valuation of the latter is twice as great as that of the former. Natural gas sells in Kansas City, St. Joseph and Joplin for 25 cents per 1,000 cubic feet, and it is generally used in these centers of population for heating and cooking, as well as for lighting, being as a rule, everything considered, found much cheaper than coal or wood. Artificial gas costs, averaging for the entire State, $1.02 per 1,000 cubic feet when used for lighting purposes, and 81 cents per 1,000 when used for cooking and heating. It is reported that the value of the by-products resultant from the manufacture of coal gas amounted to $498,287, the respective quantities having been: Tar, 3,874,454 gallons; coke, 107,381 tons; anhydrous ammonia, $498,287. In all, 196,928 places (households, mills, stores, factories, etc.) used gas for either lighting, cooking, heating or power in the year. Artificial gas was supplied to various places through 133,159 separate connections. The users of natural gas numbered 63,769, confined to Kansas City, St. Joseph, Webb City, Carterville, Joplin, Carl Junction, Rich Hill, Oronogo and Belton. Kansas City reported 44,490 consumers, using 6,686,800,000 cubic feet; St. Joseph, 10,584 consumers, using 2,669,195,500 cubic feet; Joplin, 5,515 consumers, using 1,506,962,000; Webb City and Carterville, 2,500 consumers, using 2,130,114,600 cubic feet. St. Louis, as naturally would be presumed, is the largest absorber of manufactured gas, having 114,940 consumers, who used in 1908 the quantity of 4,004,626,000 cubic feet; Springfield was second, with 3,320 consumers, using 88,991,000 cubic feet; Sedalia, 970 consumers, taking 27,147,300 cubic feet; Jefferson City, with 997 ccnsumers and 21,000,000 cubic feet; Hannibal, with 1,100 consumers, and 23,237,500 cubic feet; St. Charles, 1,200 consumers and 20,000,000 cubic feet; Independence, 800 consumers and 16,542,900 cubic feet; Brookfield, 640 consumers and 11,813,600 cubic feet; Kirksville, 600 consumers and 11,200,000 cubic feet. In the suburban districts of St. Louis there were 3,931 consumers, using 83,183,300 cubic feet. It is noted that many of the gas companies operate electric lighting plants, but no figures respecting outputs on such account are given. It is also declared that in the cities of Kansas City and St. Joseph natural gas has quite, if not altogether displaced the artificial product.

Correspondence.

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Radical Differences in Treatment.

NORFOLK, VA., March 20, 1910.

To the Editors AMERICAN GAS LIGHT JOURNAL: Reading the discussion of President Africa's address to the New England Association of Gas Engineers, which appeared in your number of March 14, it occurred to the writer that he might be permitted by you to submit something concerning which several members declared to have a personal interest in obtaining more information, relating more particularly to the treatment given by gas companies to faithful old employees. There was a time when efficient service, rendered sometimes at the risk of personal injury and even to the threatened loss of life, "cut no ice" with most gas companies. Notably was this the case with the late New York Gas Light Company, of the city of New York, before it became a branch of the present Consolidated. An illustration of this may be given later on; but the trend of policy on part of employers appears to be somewhat the other way these days, and it gives me great pleasure to inform you of the action of one firm at least (H. M. Byllesby & Co., of Chicago) and in part, also, the Edward M. Deane Company, of Grand Rapids, Mich., where dollars did not count as much as real appreciation of a trusted and faithful employee, stricken with disease and finally death.

Neither did the philanthropy of the first named firm cease with the death of the recipient of its generosity, for while they paid the salary in full (for more than 7 months) of the late George Henry Brown, then Superintendent of their Tacoma gas works, though he was unable to attend to his duties for that length of time prior to his decease, they continue his widow on the pay roll, for a while at least. As the writer never was in any way connected with either of the Companies named, nor expects to be, his motive in bringing the above to your attention may hardly be impugned. How different the action of the New York Company named above in a certain case, which may not be so uninteresting reading, even now 33 to 37 years after it happened; and as to the facts in the case, there are still many living witnesses to attest to the truth of the same, though some of the characters figuring in that transaction have "Gone to sleep."

On April 5th, 1873, the retort house men of the New York gas works, at 21st street and Avenue A, went out on a strike for an 8-hour shift. A young man, then Assistant to the late Ignatz Herzog, Engineer of the Metropolitan gas works at 42d street, was sent over to give such assistance as might be required to the late Mr. C. G. Mowton, Engineer of the New York Gas Light Company.

He found, upon entering the works alone—for a contingent of more than 200 men sent with him by the officials of the Metropolitan Company had deserted on the way—that there was not a foot of gas in the holders. Candles were used to light the offices of the Company, and huge piles of blazing cannel to give light in the retort house. There was a howling mob of strikers and their sympathizers on the outside, with some 150 policemen, under command of Captain McCullough, Jr., and 500 Italian laborers, under the Gas Company's officers, upon the inside of the works. The foremen of the Company, who had stuck to their posts, could not make the laborers understand anything. Bunks, and a kitchen with many cooks, had been installed, likewise many kegs of beer, which was dished out liberally by the Gas Company to the men, no doubt under the impression that, as the strikers had made gas formerly while also good beer consumers, the new men somehow might catch on to the trick. The young "Metropolitan," as I shall call him, saw very soon that the Gas Company was hopelessly beaten, unless some other method to make gas was introduced. He thereupon left the place, hied him to the President of his own Company, Mr. Oscar Zollikofer, and presented him with the facts as seen and a plan to successfully end the strike. I will omit details now, but mention that, with the hearty consent of Mr. Cornelius Everrett, President of the New York Company, the young Metropolitan was put in charge of the retort house, and, after being for 72 *hours* constantly on his feet, with few moments of rest between, he had a new force well organized, and the then "big" million cubic foot and the 6 smaller holders of that Company full of gas, with the new men working together, the strike was practically defeated. The "Metropolitan" then went to his home for a rest, after leaving clear instructions with the Chief Engineer, Mr. Mowton, previously named.

Just 14 days later the new force, left working harmoniously and successfully, as mentioned before, was also nearly stampeded through the action of sympathizers of the former hands, and the however innocent connivance of the Company's own officers. Then it was that Mr. T. O'Connor Sloane (the well-known writer of a number of valuable books on electricity), then the chemist of the New York Company, was sent to bring over the "Metropolitan," who came at the end of a hard day's work at his own works. Another 54 hours hard work on his part, without intermission for rest, followed, at the end of which all was going well again. After this the young "Metropolitan" was made some very good offers by the President of the N. Y. Company, and by advice of his own Chief, Mr. Herzog, accepted, to be finally rewarded as follows: Three years or so after these events a stoking machine was installed and operated by the patentees' men, who understood nothing about retort house work, and so made a botch of their machine. The Chairman of the Board of Directors of the New York Gas Light Company (Mr. Percy R. Pyne) father of the gentleman of like name now living at New York, approached the "Metropolitan," who in the meantime has been sidetracked to be in charge of the works at night, and asked him about said machine. Said he "We are asked to pay $300,000 for this machine and the right to use it, and we want to know a little more about it."

Upon the "Metropolitan" referring Mr. Pyne to the chief engineer, and also informing him that, if he ventured to say a word about the machine he would lose his official head, he was assured by Mr. Pyne as follows: "I pledge you my word, Mr. * * *, as an American gentlemen, that no harm shall come to you; and, besides, I have a right to demand of you your opinion." The "Metropolitan" had been assured, upon taking service with the Company, that he would, because of his "distinguished services" always be taken care of; kindly note *that*. So, then, upon Mr. Pyne's solemn assurance he told the truth, and 2 weeks later found in his box the following statement: "Owing to the necessity of reducing expenditure, your services will not be required after May 1st, 1877." How very different the conduct of Byllesby & Co., of Chicago! What a reward for saving that Company at least $300,000, and at the beginning risking his life—for it was threatened several times in that strike.—F. EGNER.

Plantinga's Producer Gas System.

On Feb. 22d last, U. S. Letters Patent (No. 522,700) were granted to Mr. Pierre Plantinga, of Cleveland, O., for improved apparatus for use in the manufacture of gas.

Using the words of the specification: This invention relates to apparatus for use in the manufacture of gas, and particularly to that part of such apparatus which includes means for making producer gas, which is burned for the purpose of producing the heat required for further steps in the process.

The object of the invention is to obtain a predetermined temperature resulting from the combustion of the producer gas, whereby such temperature may be made constant and the next step in the operation thereby rendered definite.

In the apparatus heretofore used, the supply of primary and secondary air has been more or less dependent upon weather and other extraneous conditions, which have caused the temperature of the burning producer gas to vary, thereby varying the resultant gas product in a deleterious manner. This variation has heretofore been partly overcome by the employment of a high stack for taking off the gases of combustion, and one of the results of my invention is to eliminate the necessity for such high stack, a material economical advantage, as is obvious.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, the disclosed means, however, constituting but one of various mechanical forms in which the principle of the invention may be used.

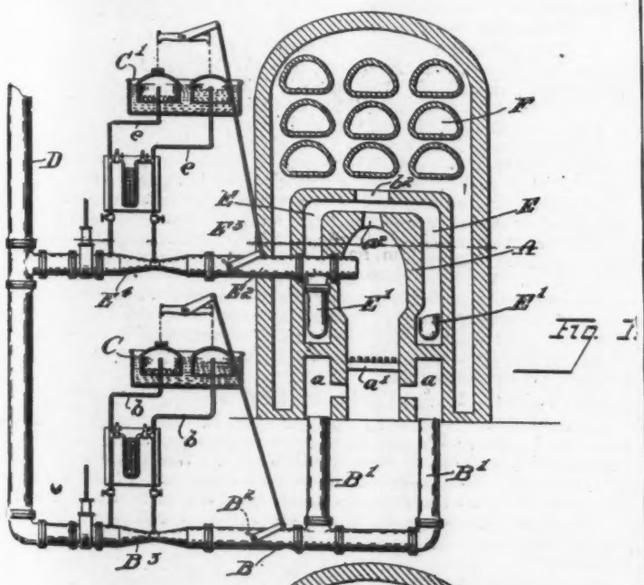

FIG. 1.

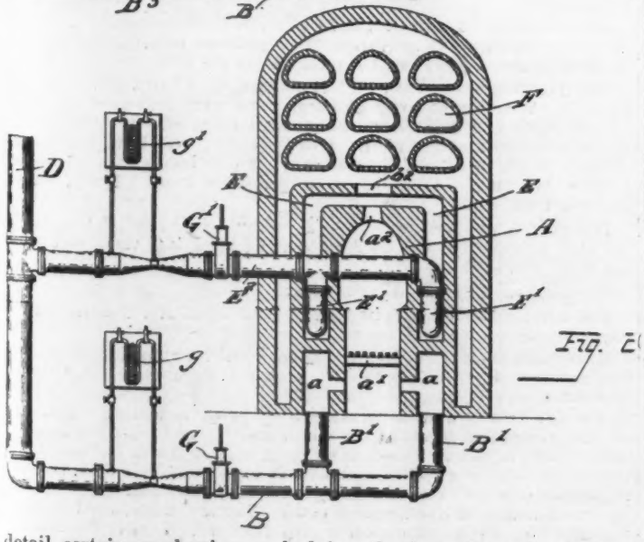

FIG. 2.

Fig. 1 is a diagrammatic view of gas apparatus embodying the invention, showing a muffle furnace and gas producer in vertical axial section. Fig. 2 is a view similar to that shown in Fig. 1, and illustrating a modified form of the invention.

Referring to the drawing, the gas producer A, of the usual form, is provided with two ducts $a\ a$, for leading primary air under the grate a^1, thence passing upwardly through the coal bed, and out of the top aperture a^2. Two branch air pipes $B^1\ B^1$ are connected with these ducts a and are themselves connected with an air pipe B, affording a common source of supply for such branch pipes B^1. A diaphragm or valve B^2, consisting of a transversely placed movable plate, is placed in pipe B, connected with a pressure device C, the latter being operated by means of a Venturi-tube B^3 interposed in the pipe B, connected with the pressure operated device C by means of suitable tubes $b\ b$. A main D supplies the air to the pipe B. The pressure operated device is so arranged that a decrease in the volume of air flow past a given point per unit of time, in the pipe B, will cause the valve B^2 to open and permit a larger quantity of air to pass. In this manner, by adjusting the valve B^2, a constant rate of flow of a predetermined quantity of air through the duct B may be obtained, and, therefore, supplid to the producer. The latter is furthermore supplied with two ducts $E\ E$ for leading the secondary air to the point b^2 where the producer gas is burned, such air being necessary for proper combustion at said point. The two branch pipes $E^1\ E^1$ connect with these ducts $E\ E$, and are themselves connected with a pipe E^2, affording a common source of air for both said ducts.

A valve E^3 is provided in pipe E^2, and is connected with a second pressure device C^1, operating in the same manner as does the device C, a Venturi-tube E^4 and tubes $e\ e$ being provided for this purpose, as will be readily understood. The pipe E^4 is connected with the common main D. It will therefore be noted that a constant flow of air through the pipe E^2 may be maintained, and a constant supply of air be delivered at the point b^2.

Located above the producer and suitably inclosed, are the muffles or retorts F, which are heated by the flame produced by the combustion of the producer gas at the point b^2, such heat being necessary for the proper distillation of the contents of the retorts, as will be readily understood. A suitable opening (not shown) is provided in the inclosing structure for conducting away the products of the combustion of such gas, as will be readily understood.

By means of the above described apparatus, the quality of the gas produced by the producer is maintained constant, as well as the supply of air for the combustion of such gas. By suitably adjusting the valves $B^2\ E^3$, it will be seen that, after the quality of the gas and the quantity of air have been predetermined to produce the most economical combustion of the gas, these predetermined conditions may be maintained so as to maintain a constant temperature to which the retorts are subjected. A uniform quality of gas is therefore produced in the retorts, such being the object sought for.

In the modified form shown in Fig. 2, the automatic feature is omitted, and the device arranged so that it may be manipulated manually. In this case the pressure operated devices are omitted, as well as the automatically operated valves $E^3\ E^4$. In place of these latter, two manually operated valves $G\ G^1$ are supplied. The Venturi-tubes are connected with the pressure gauges g and g^1, by means of which the flow of air through the pipes B and E^2 may be read. By manually operating the valves G and G^1, therefore, the predetermined quantity of air may be supplied to the producer and to the tubes $B^1\ E^1$, so as to bring about the conditions above noted. In this case, however, an attendant is required who can manually operate the valves G and G^1, when the corresponding gauge indicates a diminution or increase of the flow, as will be readily understood.

The claims are: 1. In apparatus for use in the manufacture of gas, the combination of a gas producer; means for supplying the primary air to the producer; means for supplying the secondary air to the apparatus, and means for automatically regulating the flow of such secondary air so as to maintain a flow of a constant volume per unit of time past a given point in the secondary air duct.

2. The combination of a gas producer; means for supplying the primary air to the latter; means for supplying the secondary air to the apparatus, and means for automatically regulating the flow of such primary and secondary air, so as to maintain a flow of a constant volume of air per unit of time past a given point in their respective ducts.

3. The combination of a muffle furnace; a gas producer; means for supplying the primary air to the latter; means for supplying the secondary air to the apparatus; means for regulating the flow of such primary and secondary air, and means for measuring such flow, whereby the flow of air through the primary and secondary air ducts may be made of a predetermined volume per unit of time past a given point in such ducts respectively.

[Proceedings, as Furnished by the Secretary.—Contitued from page 535.]

FORTIETH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 16 and 17, 1910.

First Day—Morning Session.

Discussion on the Paper by Mr. Bean.

The President—Gentlemen, you have just listened to a very interesting and practical paper and Mr. Bean will now be glad to answer any questions. I should like to have you all take part in the discussion. We would be pleased to hear from Mr. Nute on this paper.

Mr. Nute—Mr. President, I was wondering a little bit as I sat here why it was that we in Fall River had gone off on an entirely different line. We have been working the last few months, this winter particularly, on the arc lamp, as being the most satisfactory for general illumination. We have been putting them in extensively, the inverted arc, of course. We started out by putting in many single unit installations, and the result of a few months' experience with them was that we found where the storekeeper had both the tungsten and the single unit installations, he seemed to like the looks of the tungsten better; but where we had the arcs in, the arcs seemed invariably to be preferred. It occurred to me that a partial reason for that might be that the arcs are maintained by us and the single unit installations are not. I do not think that is the whole reason, however, for while we do not maintain the single unit installations on a regular maintenance system, we do have our men look after them as they go around, so that they have been maintained in very good shape so far. I think there is something outside of that, and that the single unit system is really not as satisfactory as the inverted arc, and we have been running during the last few months almost altogether on the inverted arcs, putting them in for store lighting and in offices and places of that kind, and they have given very great satisfaction.

The President—Is Mr. Farrow, of Cambridge, here?

Mr. Farrow—I should like to say a word in favor of both the gas arc and the single unit system. In Cambridge we find that for the cheaper class of stores and partly exposed places the arc is the better to install; but for the better class of stores, such as gents' furnishing stores, drygoods stores, offices, etc., where the surroundings are more pretentious, we find that the inverted cluster makes a superior installation. We have had very good success in Cambridge with both the single units and with the arcs. We make free renewals of mantles on the arc lights which we have installed, but we charge the cost price for new globes. In maintaining the inverted lights we charge the cost price for both mantles and glassware, and, as far as we are able, we instruct the consumer regarding the working and care of the lights, so that he may make renewals himself if necessary. As a successful competitor of the tungsten, however, I think that the inverted light is the better. We have found it to be so in many cases. We have several large inverted light installations. In one church we have illuminated the auditorium with 48 lights, all lighted by the jump-spark system, which just at present is connected to the old-style friction battery, but which will be changed to a cabinet system. Another appliance which we are using in Cambridge that I haven't heard much about elsewhere is the distance lighter on signs. If there is anyone present who can say anything on this feature of sign lighting I should be very glad to hear from him. We are very much in favor of the single unit where it can be advantageously placed, but the arc for large areas we find to be the more successful.

The President—Mr. Farrow, have you any sign lighting in operation in Cambridge?

Mr. Farrow—Yes. At present we have 7 signs lighted by gas. Of course, our electric friends feel rather sore that we should do such a thing as light a sign, for they think that is their exclusive province. In Harvard Square we have one sign 5 feet by 28 inches, that is lighted by 2 inverted lights which are operated from the inside of the store by a distance lighter. We had a little trouble at first, as the light was not properly protected from the top; but that difficulty has been remedied and everything has been working very satisfactorily since. So far we have installed the distance lighter on 4 of our signs and if you visit Cambridge later on I trust you will see many more of them.

The Secretary—I should like to ask Mr. Farrow to describe a little more in detail his distance lighting system.

Mr. Farrow—In the church we use the Welsbach jump-spark system attached to the old-fashioned friction battery with which you are all probably familiar. We disconnected the wires at the old burner and attached them to the sparker on the inverted light. Because of the poor battery used only fair results have been obtained. There are 20 lights on a circuit, of which possibly 16 will light at one time, while the battery has been operated a few more times to light the others. This difficulty, however, we confidently expect to obviate next week when we will install a new battery similar to those in use on an automobile sparker. On the sign lighting we use a pneumatic distance lighter, which has proven to be all right and which has caused us no trouble.

The President—Mr. Shattuck, we should be glad to hear from you on this subject.

Mr. Shattuck—The thing which has impressed me the most recently is the fact that there has been a sort of what we might call tungsten wave. I believe that with the proper maintenance of the reflex burners we can give several times the illumination for practically half the cost both in current and in maintenance, and I think that the gas men ought to cheer up and take considerable heart, for the tungsten has not got them beaten by a long sight. It is only necessary for them to give the matter the kind of study and careful consideration which this paper illustrates, in order to do just as good work as the electric companies can do, and regain considerable of the illuminating business.

The President—Mr. Wainwright, we should be glad to hear from you.

Mr. Wainwright—In travelling about the country I find that the tungsten wave, as Mr. Shattuck has described it, is but a temporary one. The truth of the matter is that the gas men, particularly in the Middle West, have been so dismayed at the progress of the tungsten business that they have neglected pushing their own business; but wherever they have gone after business with the single unit and with the reflexolier, it has been an easy matter to regain their former position and to replace the tungsten lamp. I remember two cases particularly, one in Indiana and one in Illinois, where previously the electric company used every effort in its power to increase its tungsten business, and now the situation has been reversed owing entirely to the introduction of the reflexolier. People in general do not realize the color effect of the tungsten light, the pinkish tone, which effect the combination of the reflexolier such as is furnished by one of the prominent companies, although not advertised to any great extent, shows to a very marked degree, and is of very great interest and of service to us in competing with the tungsten business.

The President—Lowell, Mass., has used a great many arc lights, and I should be pleased to hear from Mr. Buckminster as to whether they continue to be used there?

Mr. Buckminster—We have a church fitted up with the reflex lights on the jump-spark system, similar to what the gentleman from Cambridge has spoken of. We have a little trouble because of their lighting back and also on account of their not lighting at all. There is a static arrangement, and the janitor at times gets a little nervous and sometimes it doesn't work; but when our man goes down he generally finds that it works all right. I think we can overcome the lighting-back part by having a check valve installed. It was a sort of an experiment on our part, and we feel as though we had come out very well on it, but not well enough so that we should care to fit up any more churches in that way. Since that installation we have fitted up another church with the reflex lights but have used the by-pass system. We have trouble there with lighting-back, but the same check valve will probably remedy that all right. That particular installation is giving perfect satisfaction outside of the lighting-back. We have several signs, made in various shapes and sizes, generally of galvanized iron, and we work them on the by-pass system with the ordinary Welsbach lights.

The President—Upright or inverted lights?

Mr. Buckminster—It is an upright light in most cases; in fact in all cases, I think. We also have some large signs with an arc light inside, which have given perfect satisfaction. We found we couldn't put very much light inside of the signs on account of the heat; we had some trouble with the glass breaking. We have overcome that by using simply one upright mantle light. I can say something more about the arc lights when we get to the discussion of the arc light paper.

The Secretary—I should like to ask Mr. Buckminster a little more about the check valve he speaks of to prevent the lighting-back, because if he has a good one I should like to get it.

Mr. Buckminster—Well, that is something I can't tell you about exactly. We bought some of them years ago, and now we are endeavoring to find out whom we bought them of. They go right on the nipple which connects direct to the light. We have half a dozen of them in use now, and we are scouring our books over to find out from whom we got them, so as to get some more. I will let you know if I find out.

The Secretary—Mr. President, if I may be allowed, I take it that the idea is to prevent the air from getting back into the line between the lamp and the shut-off.

Mr. Buckminster—That is the idea.

The President—We will be glad to hear from Mr. Codman on this paper.

Mr. Codman—Mr. President, I have been very much interested in this paper, and I think the Society is to be congratulated that the gas interests are beginning to work on illuminating engineering problems in a scientific way and using modern ways of reflecting light. The electric companies have on the whole been to the fore in this scientific work, and I certainly think, as some of the speakers have said, that the more of this scientific work there is done on illumination the more the gas interests will regain the ground they have lost as the result of the introduction of the tungsten lamp. The use of the word and term "lumen" in this paper is also a step forward. I have not attended very many of these meetings and, therefore, do not know how much that term has been used. It is comparatively new everywhere, but I think the prospects are very fair that the time is coming when all our illuminants, gas and electric, will be rated in lumens instead of candle power. It is going to be a far more convenient unit. To take a simple example, supposing any source of light, gas or electric, delivers 100 lumens. Now, take the definition of lumen, as given in this paper, as the amount of light which will illuminate 1 sq uare foot of

surface to an illumination of 1 foot-candle. That means if we throw a lumen of light on an area of 1 foot we get the illumination of 1 foot-candle. If we have a source of light giving out, say, 100 lumens, and we can by some means or other project the lumens generated from that lamp, the 100 lumens on to the area we want to illuminate, which we will suppose to be 10 square feet, we shall know at once the illumination that we have obtained. It is simply a question of dividing the lumens by the area of the surface; 100 lumens divided by 10 square feet will give 10 foot-candles. Now, if we could go ahead and rate our lamps in that way, the rating would at once tell us what the possibilities were in the direction of illumination. Any lamp giving 100 lumens we know will light 10 square feet to the extent of 10 foot-candles, at least that is the maximum we can get, assuming that we can throw all the light produced on to the surface. As a matter of fact, of course, we cannot do that, and generally it is not desirable to do it. The next step is simply to bear in mind that we can generally throw on to the plane of illumination a certain proportion, a certain percentage, of the number of lumens generated, and that this runs in practical work from 40 to 60 per cent. Usually, out of a light giving say 100 lumens, 40 to 60 lumens can be turned down on to the plane of illumination, where it is desired to have it. On account of the simplicity of handling it the lumen is likely to become the uuit of rating. A step in that direction, the first step in that direction, would seem to be the use of a mean spherical candle power instead of the horizontal or some other candle power, as the means of rating. That is very likely to be accepted as the first step, and the other will follow from it. There is no question, in my mind at any rate, that we must give up the old methods of rating illuminants by horizontal candle power, vertical candle power, or any other special candle power. The only way we can tell what an illuminant will really do is to know the total flux of light, that is, the mean spherical candle power or the total flux in lumens. Another thing in this paper I am glad to see is the consideration of the proper use of reflectors in different places. It has been far too common in the past to use reflectors promiscuously without regard to what the distribution should be, and we frequently see, both in gas and electric installations, the use of concentrated reflectors, possibly in the interior of a store, with the result that the light is spotted on the floor; and then again we see in the windows, possibly, the use of a distributing reflector where a reflector of great concentration is needed. A great deal more consideration and care should be given to the distribution of light. When we know the mean spherical candle power of a lamp and have also a curve giving us the distribution, then we have the data and are in a position to figure out our illumination on a scientific basis. I thank you.

The President—I should like to hear from Waldo Learned on this question. Is Mr. Humphreys of Poughkeepsie here?

Mr. F. W. Humphreys—I haven't very much to say, Mr. President, except that we have been pushing the reflexolier; we have sold quite a number of them, and they are working very successfully. We are also selling some of the inverted arcs, but I think we are having better success, as far as customers' opinions are concerned, with the reflexoliers.

The President—Mr. C. J. R. Humphreys, you have both sides of the question to deal with, the electric and the gas, and we would be pleased to hear from you.

Mr. C. J. R. Humphreys—Mr. President, I am sorry to say that I have not had the opportunity of reading the paper, and I am afraid I cannot contribute anything of value to the discussion. It has occurred to me as I have been listening to what has been said here this morning that there is one important factor which comes into the whole question, and that is the personal preferences of the customer. As you have said, we have both sides of the lighting problem, and we try to push both for all they are worth. We have the tungsten lamp and we try to push that; we have all the other burners for gas lighting, the arc, the inverted arc and the single inverted lamps, and we try to push all of them and show our customers wherein we think that one particular form of lighting will best suit their particular property. But after all is done and said, we have to take cognizance of the fact that the customer has a certain preference. After you have demonstrated to him that he can get more light from one illuminant than the other, he has in many cases a feeling in favor of electricity, or a feeling in favor of gas, and in many instances that controls the situation. We do not make a business of maintaining the gas arcs. We do try to see that the gas arcs, and the incandescent gas burners, give satisfaction. We try to keep in touch with all of them, and if they are not giving satisfaction we try to show our customers where the trouble is. Of course, we do have some trouble due to the fact that parties come into our city and sell poor mantles, but we try to follow those up and show customers that they can get better results with a good mantle, and we do not hesitate to supply any number of mantles free in our effort to demonstrate that fact. We have, as I say, all the different systems of lighting, and we try to exploit them all, and to give the customer the benefit of all of our knowledge on the different systems of lighting.

The President—Before you sit down, Mr. Humphreys, can you tell us something about the comparative cost of lighting a room of the size of this, for example, with gas and with electricity?

Mr. Humphreys—I do not think I can.

The President—Anything further to be said on this paper?

The Secretary—Mr. President, Mr. Humphreys' remark that the customers have preferences brings to my mind a condition of affairs which I have noticed. In some sections of Boston, particularly, there are merchants who come from a race that has strong mercantile proclivities, and they have very strong preferences for a strong light. Their two expressions are that the gas "burns dark" or it "burns bright," and they want it to burn bright. They want a mantle 6 or 8 inches long, they won't have any shade over it, and you go to them and suggest that they have an installation of proper shades and reflectors and they are not interested. They want the light to burn bright. Frequently, probably with good reason, they are not particularly anxious to throw a strong illumination on their wares, but they want the light to burn bright. I think to a certain extent that may explain why in some cases an arc light, for instance, is the thing, and in other cases an installation of single units is the thing that we should try to sell. Personally I do not think I shall ever get to the point where I will try to push the use of bare mantels, because I think it is radically wrong from every point of view, except possibly the one I have referred to. A man may want his store to look bright from the outside and attractive, as though something were doing; that may be his desire rather than to show up his goods; and, if so, I suppose it is our duty to furnish him with that kind of light, provided it does not absolutely break the canons of good illuminating engineering, which we are beginning to pay more respect to than we have in the past.

A Dip into the Question Box.

The President—If there is nothing more to be said on this paper, we will close the discussion. Mr. Bean has covered the matter so thoroughly that there do not seem to be any questions to be asked. I am sure the Association appreciates the work he has put into this paper, and the paper will be used by a great many of us for reference. I extend to you, Mr. Bean, the thanks of the Association. The Secretary has a few questions that are right along in line with this subject. One of them is:

> "What is the best finish to withstand effect of heat on inverted burners?"

Can any of the members answer this question?

The Secretary—Mr. President, I do not want to take the words out of anyone's mouth, but I do want to say that I am personally interested in this matter, and I want to find a finish that will stand the heat. We have found one that seems to stand pretty well, the one referred to in the paper. I think, perhaps, the general lines to work on will be a more or less mottled finish, one which is not absolutely plain and spotless at the start, so that if there is a little change in some parts of the finish it will not be so noticeable. But I do think it is very desirable, if we can, to get a finish that we can put up in a nice installation that will not become an eyesore in an unreasonably short time. We know that ordinary brass subjected to the heat of a gas burner will discolor. I hope somebody will throw some light on this question.

The President—Who wants to answer the question? It looks as though the Secretary has answered it himself as well as it can be answered.

Mr. Nute—I should like to ask the Secretary if he has tried oxidized copper? It has a mottled finish, and we have had very good success with it. We have not tried many kinds.

The Secretary—I will say, in reply to Mr. Nute, that although we haven't called it that, yet I presume it is a combination of copper, and we have "antique" attached to it. We call it "verde antique," which, as the paper says, is a species of green. I notice Mr. Willien, of Springfield, is here. He is a chemist and perhaps he can give some scientific pointers on this question.

Mr. Willien—I do not know as I can throw any light on the subject; it is one I have not gone into in any way. It would be pretty hard to find any combination which would stand the heat continually.

The President—Does anyone else desire to speak on this question? Have you any other question, Mr. Secretary?

The Secretary—There is another question that I had hoped to bring up before Mr. Codman left.

> "How near do illuminometer readings check up with calculated illumination?"

I might say that personally I don't know. I had hoped that some information along that line might have been given with Bean's paper, but the illuminometer on which we are relying had to go back to the shop for repairs, and I don't know but it is still there. I haven't heard from it.

The President—Is the Nominating Committee ready to report? It is now within a few minutes of adjourning time, so that we haven't time enough to take up one of the other papers. The first paper this afternoon will be "Further Data on the Worcester Retort House." It will take considerable time to read it, and as we would like to have a full discussion, I hope you will all be here promptly at the beginning of the afternoon session. We will now adjourn until 2:30.

First Day—Afternoon Session.

The President—The unfinished business this morning was the report of the Nominating Committee and the election of officers. We will take it up now, if the Chairman, Mr. Prichard, will make his report.

Election of Officers.

Mr. Prichard—Mr. President, it was with a good deal of regret that the committee received word from Mr. Allen that he preferred that his name should not be presented for Vice-President. We submit for nomination the following list:

President.—W. H. Snow.

Vice-Presidents.—J. A. Coffin and D. D. Barnum.

Secretary and Treasurer.—N. W. Gifford.

Directors.—T. H. Hintze, H. K. Morrison, C. A. Learned, J. F. Wing and H. C. Crafts.

The President—Gentlemen, you have heard the report of the Nominating Committee; what action will you take?

Mr. Anderson—I move that the Secretary cast one ballot for the names as read. [Adopted.]

The President appointed Mr. Morrison as teller, the Secretary cast the ballot as directed, the teller reported and the President announced that the list of officers as nominated had been unanimously elected.

The President—I am pleased to present to you our new President, Mr. Snow.

SOME RESPONSES.

Mr. Snow—Mr. President, I beg to thank the Association for the honor it has conferred upon me in electing me President and to assure you of my hearty appreciation of the fact that it is an honor. I have been a member of the Association more years than I like to tell. I feel that I am a sort of connecting link between the old group of charter members and the present generation. I have seen the Association grow and progress, and the point that I want to impress upon you is that its progress has been due, not so much to the officers, as to the rank and file of the membership. I want to say, what has been iterated and reiterated, that the success of these meetings lies in the hands of the members themselves, and I ask for the help of each and every member in presenting papers and coming prepared to take part in the discussions, for it is through your efforts, rather than those of the officers, that these meetings are of such interest and value. I thank you all again. [Applause.]

The President—Owing to the accident that has happened to Mr. Coffin, as stated this morning, he is not present; but I am pleased to introduce to you Mr. Barnum, the Second Vice-President.

Mr. Barnum—Mr. President, I thank the members for the honor conferred upon me and I hope to be able to follow in the footsteps of my illustrious predecessors who have done so much to make this Association what it is and what we hope to keep it. [Applause.]

The President—The Secretary we hear from a good deal, so I am not going to ask him to say anything now. I mentioned this morning that this was our 40th anniversary and that of the original members of the Association there were only two left. One of them is with us here to-day, Mr. Coggeshall, and I am going to ask him to say a word to us. [Applause.]

Mr. Coggeshall—I am not much of a speaker. It is true that I have been a long time a member of this Association, for I was one of the persons who originally formed it 40 years ago. It was after the funeral of Mr. Blake. We had all felt the need of it very much indeed before that, and it has been a success for the reason that everyone has taken his part and done it well. I thank you, gentlemen, for your greeting. [Applause.]

Mr. Fowler—Has Mr. Coffin been informed of the action of the Association? If not, I would suggest that a telegram be sent to him telling him that the Association has elected him First Vice-President.

(To be Continued.)

[CONTINUED FROM PAGE 538.]

REPORT OF PROCEEDINGS, FOURTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

HELD IN THE HALL OF ELKS, DETROIT, MICH., OCTOBER 20, 21 AND 22, 1909.

SECOND DAY—AFTERNOON SESSION, Oct. 21, 1909.—*Technical Session.*

The Chairman—The next paper is by Messrs. F. E. Park and L. E. Worthing, and treats on the subject of

A RAPID METHOD FOR THE IDENTIFICATION OF GAS OILS,

which was read by Mr. Worthing as follows:

The following data have been gathered in an attempt to develop a means of distinguishing between gas oils derived from different fields. While it is manifestly impossible for an ordinary laboratory to attempt to separate and determine the constitution of the numerous hydrocarbons of gas oils, a simple method of determining the type of oil at hand would often be useful.

From several standpoints a method of identification of gas oils seems desirable. A great deal of the data on water gas oil results is conflicting. This may possibly be due to a difference in composition of the oil used, a difference which could not be determined by ordinary tests. Some slight attempts have been made to determine the gas making properties of various gas oils by small scale experiments, but the most reliable information on the values of gas oils for gas making purposes is likely to be obtained from their actual use in water gas practice. Data collected from actual practice require positive and simple methods of identification of the oil in use or a method adapted to the average gas works' laboratory. Such a method would aid in the interpretation of results collected from various sources, tend to explain discrepancies, and render results reported in gallons per 1,000 more intelligible.

Moreover, the most apparent application of a method of this kind is as an additional check on oil shipments. When water gas results fall off unexpectedly, it becomes important to discover if there has been a change in the quality of the gas oils. Specific gravity tests and fractionations do not throw a great deal of light on the subject, but further tests are usually dispensed with, as they are expensive, tedious and liable to be unsatisfactory. Luckily, to prove a change in the oil it is not necessary to determine its constitution; any simple test serving to identify the oil is sufficient. It is proposed to use the bromine absorption number, which may be readily determined, for this purpose. Before proceeding to describe the process of bromination, it may be well to review briefly the chemical composition of petroleum.

Nature of Petroleum.—In defining petroleum, Mabery states: "Now, after years of hard labor, I have reached the conclusion that petroleum from whatever source is one and the same substance, capable of simple definition—a mixture in varying proportions of a few series of hydrocarbons, the product from any one field differing from any other field only in the proportion of these series and number of the series."

Eight series of hydrocarbons, to each of which a generalized formula may be assigned, are found in petroleum, ranging from the paraffines to the naphthalines:

1. $C_n H_{2n+2}$ .....Paraffines.
2. $C_n H_{2n}$ .....Olefines and polymethylenes.
3. $C_n H_{2n-2}$ .....Acetylenes.
4. $C_n H_{2n-4}$ .....Asphaltic hydrocarbons.
5. $C_n H_{2n-6}$ .....Benzenes.
6. $C_n H_{2n-8}$ .....Phenylethenes.
7. $C_n H_{2n-10}$.....Phenylethines.
8. $C_n H_{2n-12}$.....Naphthalines.

These expressions, of which only the first five are important, are of use simply as a general classification of oils. Each one represents a group or series—homologous, isomeric or polymeric. In addition to the hydrocarbons, there are present, of course, a variety of related compounds containing oxygen, sulphur and nitrogen. Such compounds, however, occur in small volumes as compared with the hydrocarbons.

The first formula, $C_n H^{2n+2}$, represents the paraffine hydrocarbons, of which the first member is methane, CH_4, and which ranges at least as high as $C_{35}H_{72}$. The paraffines are the most important of the open chain or aliphatic series. They are the principal constituents of Pennsylvania petroleum and have been found in all petroleum except California.[1] Each member differs from the preceding one by CH_2. As the number of carbon atoms increases, the number of isomers (compounds having the same percentage composition but differing in the atomic arrangement) increases rapidly.

The liquid members follow:

Name.	Chemical Formula.	Melting Point.	Boiling Point.
Pentane	C_5H_{12}	.....	37° C.
Hexane	C_6H_{14}	.....	69
Heptane	C_7H_{16}	.....	98
Octane	C_8H_{18}	.....	125
Nonane	C_9H_{20}	— 51° C.	150
Decane	$C_{10}H_{22}$	— 31	173
Endecane	$C_{11}H_{24}$	— 26	195
Dodecane	$C_{12}H_{26}$	— 12	214
Tridecane	$C_{13}H_{28}$	.....	....
Tetradecane	$C_{14}H_{30}$	+ 4	252
Pentadecane	$C_{15}H_{32}$	.....	....
Hexadecane	$C_{16}H_{34}$	18	....

To this must be added the isomeric forms, which differ slightly in boiling points and physical properties from the normal compounds.

$C_n H_{2n}$ represents the composition of two important types of oils. First, the olefines or unsaturated open chain compounds; second, the aromatic closed ring compounds, the benzene hexahydrides, naphthenes, or polymethylenes—as they are now usually called. The olefines are not as important a constituent of petroleum as formerly supposed. In fact, they have only been positively identified in Canadian oil.[2]

The naphthalines or polymethylenes are notably present in Russian petroleum, in which they were first studied. Attention was drawn to them because of the similarity of their properties with the paraffines. They have since been identified as the predominate constituents of

1. Mabery and Hudson, "American Chemical Journal," April, 190', p. 255.
2. Mabery, "American Chemical Journal," Vol. 33, p. 151.

California and Texas petroleum, and are present in Ohio Trenton limestone oil. Members of the series from C_7H_{14} to $C_{15}H_{28}$ were isolated from California crude.

The series C_nH_{2n-2} is called the acetylene series after its first member. The lower members, however, are never found in petroleum. Texas oils contain hydrocarbons of series C_nH_{2n-2} from $C_{14}H_{26}$ to $C_{17}H_{32}$. These hydrocarbons are characteristic of oil from Texas, Louisiana and Ohio. Compounds of this formula are certainly not all true acetylenes. The isomers can be explained by the assumption of two methylene rings connected as in the manner of diphenyl, with a sufficient number of side chains or connected carbon atoms between rings to account for the formula.

In oil from Trenton limestone, Maybery and O. H. Palm[1] found hydrocarbons having the composition $C_{10}H_{34}$, $C_{21}H_{44}$, $C_{22}H_{42}$ and $C_{24}H_{46}$. With those compounds were members of the C_nH_{2n} series as high as $C_{17}H_{34}$. Texas oils contain the next series C_nH_{2n-4} from $C_{21}H_{38}$ to $C_{24}H_{46}$. This series also predominates in the heavy asphaltum oils from Louisiana.

There are probably oils of series containing much less carbon in the higher fractions of Louisiana and Texas oils, but decomposition on fractionation prevents separation necessary in order to study the pure compounds. The most promising method of getting at the constitution of these heavy hydrocarbons is by fractional filtration through Fuller's earth.

The series C_nH_{2n-6} represents the benzenes or aromatic hydrocarbons. Traces of benzenes have been found in nearly all oils, even in Pennsylvania oils. The lighter fractions of California oil, however, contain the largest per cent. of hydrocarbons of this series, which includes, of course, the toluols and xylols.

1. Benzene	C_6H_6.	4. Cumene..... .	C_9H_{12}.
2. Toluol.....	C_7H_8.	5. Cymene.....	$C_{10}H_{14}$.
3. Xylol	C_8H_{10}.		

Maybery and Hudson[2] in fractionating a California oil found 35 per cent. benzene in a fraction boiling near 80° C., in the 109° to 110° C. fraction 70 per cent. toluol, 135 to 140° C. fraction 75 per cent. xylol, and at 220° to 222° C. the distillate was solid with naphthaline. If there are any paraffines in California oil they occur in distillates below 70° C.[3]

Members of C_nH_{2n-8} and C_nH_{2n-10} series have also been identified in small amounts in California petroleum. The oil from the mid-Continental fields has a wide variation in composition and contains many different series. Small quantities of oxidized compounds are found in petroleum as acids and phenols. Phenols occur principally in California oils. Nitrogen is found in all oils, and in the case of California oil, compounds of the formula $C_{13}H_{17}N$ to $C_{17}H_{31}N$ constitute from 10 per cent. to 20 per cent. of the crude petroleum. The nature of the sulphur compounds in petroleum is not well understood. It appears in many forms from occluded H_2S to so-called thiophanes. In Lima oil sulphur appears to be in the form of sulphides. Ten compounds, from C_4H_4S to $C_{13}H_{14}S$, have been isolated.[4] Canadian petroleum in the higher fractions contains compounds of the formula $C_nH_{2n}S$.[5] Texas oil, besides organic sulphur, contains large amounts of free hydrogen sulphide.

Summarizing the characteristics of the principal American oils: Texas oil is remarkable for its asphaltic inert properties, Pennsylvania paraffine oil is even more chemically inert, California oil contains benzenes, and Canadian oil contains open-chain unsaturated hydrocarbons. The other types have less striking peculiarities. As gas oils usually are fractions of about 33° B., they contain not only a portion of the original oil, but are liable to contain products of decomposition caused by cracking. These decomposition products may cause the oil to exhibit properties—as it does indeed contain compounds—completely different from the original.

Process of Bromination.—The notion of treating hydrocarbon oils with bromine has been derived from the custom of identifying vegetable or animal oils by their so-called bromine or iodine numbers. The idea of determining the amount of bromine an oil will take up is not a recent one, but dates back to 1857, to Cailletet, a Frenchman, who describes a method of treating oil with an alcoholic solution of bromine and titrating the excess bromine with a turpentine solution until the color is discharged.

In 1881, A. H. Allen proposed a method for brominating oil in which the bromine was liberated in contact with the oil by the decomposition of a water solution of sodium hypobromite with hydrochloric acid. Two years later Mills and Snodgrass proposed the use of carbon bisulphide as a solvent. These various schemes were all intended, principally at least, for the identification of vegetable or animal oils, which gave characteristic bromine absorptions, and for the detection of their adulteration.

The most satisfactory method involves the use of carbon tetrachloride as a solvent. This scheme was first used by McIlhenny[1] and is recommended principally because of the increased stability of the carbon tetrachloride bromine solution, and of a sharper end point in titrating. One of the reasons for the increased stability of the carbon tetrachloride over the carbon bisulphide can be inferred from a consideration of their boiling points.

Carbon bisulphide boils at 43° C.; bromine, at 63° C.; carbon tetrachloride at 77° C.

Another is the fact that carbon bisulphide forms various sulphur bromides in solution and liberates free hydrobromic acid.

The method we have used is an adaptation of McIlhenny's. Twenty-five c. c. of a tenth normal solution of bromine in carbon tetrachloride, previously standardized against sodium thiosulphate, is agitated with ½ to ¼ gram of the oil to be tested in a stoppered Erlenmeyer flash. Before mixing, the sample of oil should be dissolved in 25 to 30 c. c. of carbon tetrachloride. The mixture is then allowed to stand in the dark for 30 minutes. The carbon tetrachloride solution and the oil to be tested should be previously dried by use of a few sticks of fused calcium chloride.

At the end of 30 minutes about 100 c. c. of distilled water is added to the flask, with 2 grammes of potassium iodide, and the unabsorbed bromine titrated against a tenth normal sodium thiosulphate water solution. Starch solution is used as an indicator. The end point is reached when the bromine color of the oily layer has disappeared, and the iodine blue of the starch and water solution is just discharged. The oily carbon tetrachloride solution should appear red before titrating or insufficient bromine solution has been used.

The hydrobromic acid formed during the bromination is titrated against sodium thiosulphate by adding half a gramme of sodium iodate to the flask, after the titration is finished, and titrating to the second disappearance of the blue color. Or, the hydrobromic acid may be titrated against N/100 caustic after separating from the oily layer. Better results can be obtained from the iodate method by first separating the oily layer from the water solution.

Both the absence of sunlight, and the careful drying of both oil and tetrachloride are most necessary, as light accelerates the bromination of the saturated compounds, giving rise to an undue proportion of substituted bromine; and the presence of the smallest amount of moisture is even more effective in accomplishing the same result. The addition of the bromine solution and subsequent titration with sodium thiosulphate need not, however, be made under artificial light, as by carefully duplicating the conditions of experiment very concordant results may be obtained. The total bromination number is the number of grams of bromine absorbed per 100 grams of oil. The bromine substitution number is the amount of bromine found as hydrobromic acid after the bromination is completed, calculated to the same basis. The bromine addition number is calculated by subtracting twice the bromine substitution number from the total bromination. This calculation is based on the following equations:

$$2C_2H_4 + Br_2 = 2C_2H_4Br. \quad \text{or,} \quad C_2H_4 + Br_2 = C_2H_4Br_2.$$

(Ethylene) (Ethylene bromide) (Ethylene) (Ethylene di-bromiee)

Example of substitution:

$$C_6H_5CH_3 + Br_2 = C_6H_5CH_2Br + HBr.$$

(Toluol) (Hydrobromic acid)

It is evident that for every substituted bromine compound formed an equal amount of hydrobromic acid is formed. Hence, it is necessary to deduct both the bromine of substitution and the hydrobromic acid bromine from the total absorption to find the amount going to form addition products. Both the olefines and the acetylenes form addition products, so that in a general way it may be assumed that large addition numbers indicate acetylenes, olefines, or ring compounds with unsaturated side chains. Large substitution numbers—benzenes and small total bromination—paraffines or naphthenes. If paraffines were attacked by slight exposure to daylight, substitution products would be formed.

While it would not be fair to assume that the members of the differ-

1. American Chemical Journal, Vol. 33, p. 251.
2. "Chem. Ind.," 1900, p. 502.
3. "American Chemical Journal," April, 1901, p. 255.
4. "American Chemical Journal," Vol. 13, p. 233. Proceedings Am. Acad., Vol. 41, p. 89.

1. "Jour. of Am. Chem. Soc.," Vol. 16, p. 275; Vol. 2, p. 1084.

ent series are present in direct proportion to the substitution, addition, or absence of bromination in the case of a single oil, between the various oils the results of bromination would indicate which oil contained more of a particular series.

The above described process was carried out on samples of oils differing largely in character and from widely separated fields. Through the courtesy of the St. Louis, San Antonio, Los Angeles and Denver Gas Companies, and the Standard Oil Company, we received samples of gas oils of the principal types found in the United States. We also tested samples of Canadian crude. Fractionations, sulphur content, heat values and bromine absorption are given in Table No. 1 and No. 2.

TABLE No. 1.—*Fractional Distillation.*

Name.	Specific Gravity.	Point of Distillation	Up to 302° F.	302 to 572° F.	572 to 662° F.	662° up.	Distillation Loss.
Laclede, St. Louis.	31.7° B.	196° F.	4.3 p.c.	30.7 p.c.	39.3 p.c.	20.7 p.c.	5.0 p.c.
	Spec. grav.:	59.2° B.	38.7	30.7	26.2		Carbon.
Denver G. & E. Co.	32.4	164	3.3	37.3	44.3	14.3	0.8
	Spec. grav.:		60.4	35.7	30.3	26.3	Carbon.
Florence, Col.	34.0	130	3.7	34.3	45.7	16.0	0.3
	Spec. grav.:		44.8	36.3	34.0	30.0	Carbon.
Sugar Creek, Mo.	32.5	173	4.0	37.7	21.7	33.3	4.3
	Spec grav.:		53.8	38.0	31.3	27.0	Paraffine.
Florence, Col., No. 2	30.9	194	1.0	7.7	37.7	53.0	0.6
	Spec. grav.:		.....	40.9	33.3	29.6	Carbon.
Boulder, Col	32.0	168	0.7	1.7	27.7	66.0	3.9
	Spec. grav.:		.....	.....	33.7	32.4	Paraffine.
Canada, Crude.	41.9	174	19.3	43.3	31.7	1.0	4.7
	Spec. grav.:		57.2	46.1	37.3	.....	Pitch.

Name.	Specific Gravity.	Point of Distillation.	Up to 310° F	310 to 475.	475 to 570.	570 to 690.	690 up.	Distillation Loss.
Utl. 11,831 D. C. Gas Co.	34.4	211	7.3	29.3	21.3	32.7	8.3	1.1
Spec. grav.			53.7	40.5	33.5	28.5	26.5	Carbon.
San Antonio, Tex.	22.1	172	3.3	13.0 (1.7 water.)	22.7	53.0	4.2	2.1
Spec. grav.			51.3	35.1	27.8	23.9	Asphalt.	Carbon.
Los Angeles, Cal.	20.1	218	5.7	15.3	12.0	33.7	21.3	10 per ct. asphalt.
Spec. grav.			54.3	39.6	29.3	24.1	22.1	2 p.ct. loss. Carbon.

TABLE No. 2.

Name.	Spec. Grav.	Total Bromination.	Bromination Substitution.	Bromination Addition.	Sulphur.	B.T.U.
D.C.G. Co. Utl. 11,831	34.3	26.67	6.42	13.83	0.26	18,867
San Antonio, Tex	22.1	10.38	3.57	3.24	2.09	18,750
Los Angeles, Cal	20.1	22.22	9.81	2.60	0.80	18,538
Pennsylvania	34.4	11.20	2.99	5.22	0.26	18,843
Laclede, St. Douis	31.7	24.98	5.45	14.04	0.56	19,526
Denver G. and E. Co.	32.3	10.70	2.58	5.54	0.52	18,851
Florence, Col	34.0	5.48	1.48	2.52	0.31	20,131
Sugar Creek, Mo	32.4	16.41	4.46	7.49	0.25	19,311
Florence, Col., No. 2	30.9	14.15	3.37	7.41	0.35	18,904
Boulder, Col	32.0	7.98	2.40	3.18	0.28	....
Canada crude	41.8	4.87	0.46	3.95	0.50	....
Pentane	..	0	0	0	0	....
Toluol	..	2.80	1.40	0	0	....
Benzol	..	0	0	0	0	....
Xylol	..	6.34	2.43	1.48	0	....

Pennsylvania oil, Florence, Col, Boulder, Col., and Texas oil appear to have a predominance of paraffines or naphthalines. Detroit City Gas Company's oil and Laclede (St. Louis) oil seem to be largely olefines or unsaturated ring compounds, while Los Angeles oil is remarkable for the presence of benzenes, and Canada oil for the absence of them.

The proportionate large amount of additional bromination in the case of Canadian crude is further evidence of the presence of small amounts of olefines. The apparent presence of olefines or other unsaturated compounds in the Detroit City Gas Company's oil and in the Laclede is probably due to the cracking of the original oil. Toluol shows exactly the theoretical substitution, xylol shows a preponderance of substitution and some additional products probably due to impurities. Both these products, of course, belong to the benzene series.

The lack of action in the case of benzene is to be expected in the absence of carrier. It is readily brominated in the presence of certain foreign bodies which promote the action. The failure of benzene to react with bromine in a pure state indicates what an important effect a mixture of oils and the products of bromination may have on the amount of bromine absorbed. To test the effect of mixing oils on bromine absorption, the Detroit and San Antonio oils were mixed in exactly equal proportions by weight with the following results:

By test:	
Average total bromine absorbed	20.60
Average substitution	5.36
Average addition	9.88
Same by calculation:	
Average total bromine absorbed	18.52
Average substitution	5.00
Average addition	8.53
Effect of mixing benzene and Florence oil:	
Average total bromine absorbed	4.91
Average substitution	2.12
Average addition	0.68
By Calculation:	
Average bromine absorbed	2.74
" substitution	0.74
" addition	0.63

It is apparent that the effect of increasing the number of constituents increases the amount of bromination. The total bromination of a mixture may then be assumed to be above figures calculated from bromination numbers of pure constituents. Evidently, impurities in oil have the effect of accelerating slightly the bromination of hydrocarbons aside from their own action in absorbing bromine. Hydrogen sulphide is the impurity which probably causes the greatest error in interpretating the results of bromination, as it forms hydrobromic acid and free sulphur. If all the 2.09 per cent. of sulphur in San Antonio oil were hydrogen sulphide, the error would be 5.2 grammes of bromine per 100 grammes of oil, or sufficient to account for half the total bromination. However, in oils giving large bromine absorptions the amount of hydrogen sulphide present is nil, or negligible and the possible error due to its presence is very slight. To test the value of the method in identifying a single type of oil, the following samples were brominated:

TABLE No. 3.

Kind of Oil.	Car No.	Specific Gravity.	Total Bromination.	Addition.	Substitution.
Sta. A Utl	11,831	34.4° B.	26.67	13.83	6.42
Sta. A Utl	8,553	36.1	28.18	14.06	7.06
Sta. A Utl	7,867	36.0	29.45	14.39	7.53
Sta. A Wks. pump.	....	36.1	31.35	16.03	7.66
Sta. B Utl.	8,513	33.6	32.07	15.33	8.31
Sta. B Utl.	7,545	33.6	33.07	14.54	9.23
Grand Rapids Utl.	9,405	33.0	27.18	9.54	8.82
Laclede, St. Louis.	....	31.7	24.98	14.04	5.45

Grand Rapids and St. Louis gas oils are included in the above table only because they are all approximately of the same type. Detroit gas oil has the following average bromination numbers:

Total Bromination.	Addition.	Substitution.
30.13	14.73	7.70

It varies from the average figure by + 9.8 per cent. to − 10.7 per cent. Such variation would be expected in view of the range in specific gravity from 33.6° B. to 36.1° B. The Denver Gas Co.'s oil shows a striking similarity to the Pennsylvania gas oil, and, in turn, to the San Antonio gas oil, though the first two are undoubtedly largely paraffines and the last a polymethylene or naphthaline. An idea of the bromine values of oils which are published can be obtained from Table No. 4.

TABLE No. 4.

Oil.	Specific Gravity.	Total Bromination.	Addition.	Substitution.	Authority.
Shale	35.8° B.	48.2	....	...	Allen[1]
American pet.	36.6	32.3	....	...	"
Russian pet	32.0	1.9	1.70	.10	"
Cal. pet. Puente Field.	....	18.8	....	...	Mabery[2]
Puente Field	....	18.3	....	...	"
Shale	33.5	22.24	....	...	Mills and Snodgrass[3]
Shale	31.9	20.59	....	...	"
Shale	28.0	12.59	....	...	"
Shale	26.0	11.72	....	...	"
Mineral	45.0	27.57	....	...	"
Illuminating	45.5	30.31	....	...	"

1. "Commercial Organic Analysis," Vol. 2, p. 95.
2. "American Chemical Journal," April, 1901, p. 255.
3. "Journal Society Chemical Industry," Nov. 29, 1899, p. 966, 435.

The report of Mills and Snodgrass on shale oil in the above table shows that the absorption of bromine with shale oil varies inversely as the density of the oil.

Summary.—By treating gas oils with bromine dissolved in carbon tetrachloride, under specified conditions, a characteristic bromine absorption number can be obtained having an allowable variation of ± 10 per cent., which may be used to identify the oil and serve as an additional check on the composition of gas oils, besides the specific gravity and fractionation tests. As an aid in distinguishing between saturated and unsaturated hydrocarbons, the amount of hydrobromic acid formed during the bromination is determined. The total amount of bromine absorption and the per cent. of hydrobromic acid formed are considered together in deciding as to the type of oil. For purposes of water gas manufacture the method is exceedingly reliable and sufficiently accurate, and, in the case of a single sample, the addition and substitution numbers may, by carefully duplicating the conditions of experiment, be checked to within $\frac{1}{10}$ gramme of bromine in every case. Two 50 c.c. burettes are the only apparatus required. About two hours are necessary for a duplicate determination.

Discussion.

The Chairman invited discussion on the paper.

Mr. Fulweiler—There are several points relating to the practical application of the method discussed in this paper that I should like to have more fully explained. In general I believe it will be found that commercial gas oils are mixtures of the varying distillates. Admitting now that in nearly all distillations more or less cracking occurs, and that this cracking masks or changes the character of the original oil, would figures furnished by the bromination test serve to identify the origin of the gas oil, or would not the fact that, while in certain fractions of the crude oil we may have a preponderance of a definite series of hydrocarbons, which are characteristic of this oil, yet in making the mixture that is sold as gas oil, might not these characteristics be either entirely lost or unduly prominent, so that for identification purposes the original characteristics would be destroyed? Again, many oils are blown with air or steam during the distillation. Would not this seriously affect the bromination values of distillates secured in this way? If we grant that this method does recognize the preponderance of the members of a certain series of hydrocarbons, do the writers in their practical work in connection with this test feel that it will be possible to assign a figure of merit to oils which have characteristics indicating the preponderance of one of the hydrocarbon series? Or, in other words, which series of hydrocarbons yields the highest candle power per gallon, and what are the comparative merits of the different series? In connection with this point I note that the Pennsylvania, Colorado and Texas oils seem to yield, approximately, the same bromination figures. Have the writers any data as to practical results which would seem to bear out this apparent similarity in composition? The paper refers to the presence of the unsaturated olefines in the gas oil used in the Detroit city works, as indicating that the oil had been cracked in distillation. Do they conclude from this that in general all cracked oils will show unsaturated hydrocarbons, and is this in general the course which the hydrocarbons take in distillations at high temperatures? Referring to the practical application of the test, have the authors found it necessary to run a check or blank determination along with the other samples, as is usual in carrying out similar tests, in order to prevent or detect errors due to adventitious local conditions? Have the authors made any experiments with the sulphonation test to check up their results from this bromination test?

Mr. Park—As to oil, it is certain that cracking is a very large factor. Cracked oils absorb a great deal of bromine. When these oils are treated with sulphuric acid and caustic, until they are largely purified, it is found in subsequent brominations that the bromine absorption very largely decreases. The only point that can be taken to show the difference between oils is simply the figures we have already produced, which show that Texas and Pennsylvania oils do not have a large bromine absorption. As to the running of blank determinations, we ran some tests with xylol, benzene and various oils, which showed no bromine absorption whatever, which is sufficient to show that there is no error in the determination.

Mr. Fulweiler—The principal inquiry I wanted to have answered was whether you had any practical figures which would seem to show that the oils which apparently contain a preponderance of one or more of these series gave better candle power per gallon figures? That is, what is the per gallon application of it?

Mr. Park—We have accumulated no data on the relation between bromine absorption and candle power.

(To be Continued.)

[Official Report—Concluded from Page 540.]

SECOND ANNUAL MEETING, INDIANA GAS ASSOCIATION.

Held in the Claypool Hotel, Indianapolis, Jan. 19-20, 1910.

Second Day—Morning Session.

Discussion on the Danforth Paper.

The President—I will call upon Mr. Thwing to open the discussion.

Mr. Thwing—Mr. Danforth has so thoroughly covered the subject in his admirable paper that there is nothing for me to discuss at the present time except to approve of all that he has said. He has been through the experience as related in his paper, and what he says are, as far as I know, facts. I believe that his statements will be of great value—his paper will be of great value—to those who will be called upon in the near future to change over natural gas distribution systems to the artificial gas.

The President—Mr. Beers, have you anything to say?

Mr. Beers—There is no question about the pertinence of a paper of this kind, because of the failure of natural gas. I should like to ask what is the usual figure of leakage and the steps taken to determine whether the leakage is on the high or low pressure. I should like to know what the usual figure for high pressure is, what his figure is for the usual basis on the main system for 3-inch basis. I would like to know whether he used a baffle plate in the compression tank to remove the moisture in the gas. It would also be very interesting to know approximately what results were gotten from tssts of the high pressure at 80 pounds. That is, what drop in pressure there was. I made a good many tests of that kind myself. I remember it was 60 pounds pressure one day late in the afternoon and the next day at noon I had 65 pounds on without adding anything to the line. It was all due to a change in the weather; it got about 20° warmer. The question has come to my mind as to the advisability of going to the expense of repairing the old system of mains, which cannot have a great deal of life left, and the installation of an expensive holder, over that of putting a new system of mains very much smaller in size and distributing altogether by high pressure, using individual regulators. If you have any ideas on that subject I would like to hear them.

A Member—I would like to ask Mr. Danforth, in changing from natural to artificial gas, without any special delay in making the change, what percentage of loss of consumers will probably follow the change?

Mr. Rowland—In testing out the lines with water, I should like to know what the objection was to that method of testing? I was a little in doubt as to what Mr. Danforth said about regulator vaults in houses. The vaults, as I understand, are objectionable on account of rust. When it comes to locating the regulator house on natural gas lines I think it has been the practice in a great many places to locate a vault in a side street, or some place of that kind. Where it is changed to a house proposition on private property, what is the system of that change?

The President—Mr. Summers, have you anything to offer?

Mr. Summers—As a last resource we try everything with water. We apply to the water company for water, which they kindly give us, and find the leaks inside of a few minutes.

The President—Mr. Griffin, have you had any experience at Vincennes of this kind?

Mr. Griffin—I think as Mr. Summers says that the water test is the best test. Now, in reference to placing regulators. In our old Indianapolis system here we generally placed the district regulators in the mains in the streets. In a great many of them we found that the rain and snow, and everything, got in there and soon rusted them up and got them very dirty, and it was a very dangerous place for one man to go into, and so in Vincennes we have changed that and put regulators above ground, sometimes on the side streets, sometimes on the main street where the main goes down. A man can get in there and feel perfectly safe. We put up nice little houses; we have them well ventilated and you can keep them clean,

keep them painted and they always look nice. A regulator over ground will work better than a regulator underground. That is my experience.

The President—There are several gentlemen over there whose names I do not know. Possibly some of them feel slighted upon not being called on. I wish if there are any present who have had experience in this direction, or who can add to the fund of information, that they will please rise without my having to ask them to do so.

Mr. Bippus—I am interested in the question the gentleman over there asked about, the percentage of the consumers the company will lose in changing from national to artificlal gas.

Mr. Moncrieff—I should like to ask why the authorities objected to putting the artificial gas into the old natural gas mains?

Mr. Symms—I might give you some information relative to high pressure plants, because that is what I am operating. We have no mains larger than 4 inch and our plant has been installed over 4 years. I had had no experience in the gas business at that time, and I put in a high pressure system because somebody told me to; since that time everybody has told me I made a mistake and I thought I did, but I want to say this, if I was going to build a new plant I would put in a high pressure line. In the first place, if a man knows anything about the gas business, if he understands it thoroughly, why, he won't build a line at all; in the second place, if he is a fellow that don't know anything about it that builds a gas plant, he don't know or can't guess where his burden is going to be, and he puts the small main where he ought to have the big one on his low pressure system, and consequently he doesn't give the service he wants to give and that the consumers would like to have. The high pressure plant can be put in cheaper, and after your business is thoroughly established, if you want your low pressure, you can have it. You know where your business is. That is my theory. There are certain times of day I carry about 2 pounds of pressure, and when I need it on the peak loads I boost the pressure up. That is something I don't believe you can do with a low pressure system. In fact, people have always got the gas when they want it, provided they pay the bill. In placing the regulators I have a system. I take a regulator and put it on the main line. The way I place that is, I dig a pit and cement it and make a good tight pit, with a good bottom and top and put a drip connection to the sewer, so that there will not be any water in the pit. I have no trouble with it at all. Ordinarily each house has a regulator. I find this advantage: If a house pipe is small, I just screw a regulator down. I am giving it with a high pressure system and regulators. I repeat again, if I was going to build a plant, I would build a high pressure plant.

The President—Mr. Symms, you have advanced some theories and ideas to some of the members that are new to all of us. Last night you were talking to me on the advantages of the consumption of gas for the prevention of diphtheria. Will you please explain that to the audience. [Laughter and applause.]

Mr. Symms—I am not a doctor, but I know this, that where peo ple use gas for cooking and lighting a house they don't have diph theria. I know that sonnds strange to most of you, but l investigated it as well as I was able to. There were about 40 cases of diphtheria in Linton in the last 3 or 4 years and not one happened where they were using gas. I think it ought to be looked up. I don't know what the experience of the rest of you has been, but if it is true that gas prevents diphtheria I think for the benefit of humanity we ought to know it. I believe you will find there is something in it; how much I don't know. [Laughter.] I was talking to a doctor about it and he said he didn't see why it wouldn't have the same effect on scarlet fever and the croup. I told him I didn't know anything about scarlet fever, but I thought it would affect croup. I know I am right as far as I have gone, but I haven't gone very far. [Great applause.]

The President—I believe Mr. Symms has demonstrated the fact that he has nerve, and that is what we need for the gas business. Mr. Eves to-day explained to us why the atmosphere of a large room was more hygienic by reason of the burning of gas instead of electric arcs. At the meeting of the Western Gas Association there were two papers presented, one by Mr. James Ferrier and one by Mr. Thomas D. Miller, on the hygienic effect of the use of gas, and Mr. Miller, whom many of you know, and who is a chemist of accepted thoroughness as far as ideas and principles go, suggested the idea that in the event of an epidemic of disease in a community, if the authorities could be prevailed upon to let the gas companies send an excessive amount of sulphur through the pipes, that the burning of that sulphur in combination with oxygen would prove a disinfectant. How far that could be put into practice I do not know, but Mr. Miller is a man whose opinions all of us who know him have respect for. I would like to ask Mr. Graf to give us his idea on that subject. We know we burn sulphur in houses for the purpose of disinfecting, but whether the infinitesimal amount in our gas would do any good or not I do not know. The Gas Commission of Massachusetts has recently stated that it is not harmful, and I believe they have recommended the limit to be increased to 30 grains per 100 cubic feet. Now, does not the burning of that small amount of sulphur make a disinfectant to that extent.

Mr. Graf—Mr. President, I have never given this matter any consideration. There is no question as to the efficiency of sulphur as a disinfectant. Mr. Symms spoke to me some time ago in reference to his theory and I told him frankly that I didn't think there was anything in it. At the same time I told him it would be a very easy matter to take the Board of Health records and the list we had in our office of the consumers of gas and check up in the large cities as well as the small towns. I also suggested that if there were any such quality in artificial gas that during the time of natural gas when everybody used it and it contained pretty nearly 2 per cent. of sulphur, there ought not to have been a case of diphtheria in the whole State.

Mr. Pickens—To come back to the discussion of Mr. Danforth's paper. Did I understand that he installed drips on his high pressure lines after he changed over to an artificial gas system, or did he leave out drips on them and use a compressor at the plant, or baffle plates to take out the condensation on the high pressure lines.

Mr. Beers—I think a high pressure line is much better than a low pressure line where you don't know what the consumption is going to be.

The President—Is there anything further, gentlemen? If not, Mr. Danforth will close.

Mr. Danforth—In regard to the question as to high pressure leakage and how to compute it, I will say this: That the high pressure is computed on the same basis as the low pressure is computed, except that the volume of gas in the pipe is increased according to the increase in the pressure over and above what the low pressure would be. I believe the American Gas Institute or the Western Gas Association have given out that 100,000 cubic feet per mile for a year is considered good practice for the average leakage. That was the figure that we took at the time we computed our leakage, and on a high pressure main if the increase in pressure is twice the atmospheric pressure plus what your low pressure would naturally be, your leakage through the same orifice would be twice. Our leakage was computed on that basis for the high pressure line.

Mr. Griffin—After you pumped up your pipes, how long did you leave the test stand?

Mr. Danforth—The test started at 80 pounds and dropped to 5 pounds.

Mr. Griffin—How long was it in dropping?

Mr. Danforth—It took about 4 days in a stretch of 29 miles of pipe.

Mr. Griffin—You would consider that a regular test, dropping that distance in 4 days.

Mr. Danforth—Yes. The figures were estimated between various pressures and the leakage, of course, was higher at 80 pounds, from 80 to 70 than it was from 70 to 60, and then we decided that the better way to determine the leakage that would occur on the line while we were compressing would be between the pressures at which we were pumping most of the time; so, in order to be very conservative, we took a figure between 21 pounds and 15 pounds and figured the drop in pressure between those points. As it is now, we compress our gas at about 15 pounds. At that pressure it reaches the end of the line nicely. Our pressure, when it was figured, was figured a little higher than it is now.

Mr. Griffin—How does it come out in practical use?

Mr. Danforth—As near as we have been able to ascertain the test is about right.

Mr. Beers—Have you any idea what the loss would be in 29 miles of pipe on high pressure mains in cubic feet in a month or year?

Mr. Danforth—It all depends on how long you keep the pressure on the line. I judge the loss per day would run between 6,000 and 7,000 cubic feet. The compression tank is 2 miles from the point of compression, and between the compressor and this tank there are no other tanks. It is simply a straight 8-inch line, or as near straight as possible, and this tank is not used as a pulsation tank as much as it is for the drip. The main reason that the tank was put in was for the condensation which would accumulate in the line and in this 2 miles would be collected in this tank. We have 2 or 3 line drips on this

8 inch line before it reaches the compressor. We are able to get a little water out of these drips and we find on the opposite sides of the compressor tank we have very little water—that the drips are nearly dry. The compression in 2 miles of travel has taken out about all the condensation in the gas. There are no baffle plates in the compression tank. The gas enters the tank at the top at one end and comes out near the top at the other end.

Mr. Beers—You say there are no drips between the compression tank and the end of the high pressure line, the holder end.

Mr. Danforth—Oh yes; simply put on a T in the line, turning the T down and with movable joints, and ran them out to the side of the road and put on a stopcock and a cap.

Mr. Beers—How do you blow?

Mr. Danforth—Well, a man was on the line some time ago and he couldn't find anything to blow except gas.

Mr. Beers—How much water do you find gets past the compression tank?

Mr. Danforth—We have never been able to collect any of it. I think the questions as to the drop in pressure have been answered. Now, in putting in a new system, or making it a high pressure system, in these towns we supply with high pressure gas, or through the high pressure line, the cost of repairs in this one town—the other town is not in shape to receive gas or to be tested up—but the cost of repairs of the mains in this one town, I think amount to about $150 all told. Now, it would not to my mind be advisable to run a high pressure line 29 miles over the country roads and deliver a straight high pressure at the other end of the line without the holder solution, with a low pressure or another compressor at the other end to take it away from the holder, if it must be high pressure. But I would not for a minute advocate a high pressure line with the compressor located 29 miles from the consumers as an advisable scheme. I think the loss of consumers in the city I have in mind during the time of the change from natural to artificial gas was about 6 per cent. of the total.

A Member—Was there much interruption of the service?

Mr. Danforth—There was. The price of gas was a much mooted subject at that time, and the company was not doing any work to speak of in extensions, or putting in any services, or turning on any gas.

A Member—You would not expect any such loss where the service was practically uninterrupted?

Mr. Danforth—You would have some people who would have to be educated to artificial gas, the question of price being prohibitve, and until they are made to realize that artificial gas as made to-day really costs less than natural gas, there will always be a loss when the change is made. Water as a test on the main system I should say would be all right where you have to put in your drips in order to take care of your distribution; but where it is not necessary and where something else could be substituted, I do not see the necessity of putting in water and then having a hard time to locate your leaks. I don't understand just how Mr. Summers went about it to locate his leaks after he put the water in or at what pressure.

Mr. Summers—Fifty pounds water pressure, just what the city had.

Mr. Danforth—In the case of a large leak wouldn't it be liable to do considerable damage with 50 pounds water pressure?

Mr. Summers—No. Two or three men walk along the line and it just shows the water bubbling up and they can shut it off.

Mr. Danforth—I think with anything that has a noticeable odor, a leak can be located where there is an asphalt pavement within a space of 3 or 4 feet by using a steel bar and sledge hammer. I have located a number of such leaks in this way. Where the city charges a high rate to cut the pavement we had to be very cautious in determining the location of our leaks, as to reduce the expense to a minimum. In a great many instances we have dropped right down to the center of the leak, but this takes a man with a keen nose and one who is very much interested in the work. We had no difficulty with the 26 per cent. concentrated ammonia in this system to locate our leaks.

Mr. Barnes—How long did the ammonia have to stay in?

Mr. Danforth—Long enough to saturate the ground.

Mr. Summers—You must understand the water is the last resource after everything else fails.

Mr. Danforth—We have found the vaults to be rather an undesirable feature, and in getting regulator houses in which to instal the regulators, we found that the regulator houses could be built for a very small sum, and if we were on other people's property it was an easy matter to secure a lease with the privilege of renewal, and as a rule the house could be set out of the way, or in the back part of the yard, or over in one corner, so that there was no objection to the house being located where it was. I never saw a vault that was not heated by some artificial means to keep it dry but what was wet, but what there was moisture in it. You would find it on the walls, you would find it on the roof and you would find it on the floor. At least that has been my experience. In regard to Mr. Pickens' question about the drips. The drips that were installed in the city in which we changed over the system for artificial gas, in which city the gas is made where it is distributed and is low pressure gas and has not been compressed. These drips have been made of wrought iron pipe, 8 to 10 to 12-inch bases, with caps and various sundry miscellaneous fittings on either end and attached to the bottom of the main leading over to the side, at right angles from the main, and the risers were connected to the other end. They are not large enough.

The President—Mr. Danforth, on behalf of the Indiana Gas Association, I thank you. Is the committee on the offer of Mr. Graf to have Mrs. Hawkins instruct demonstrators ready to report?

Mr. Barnes presented the following

REPORT ON OFFER TO INSTRUCT DEMONSTRATORS.

Your Committee to whom is referred the matter of the offer of the Indianapolis Gas Company's services, in the instruction of women for demonstrating work, beg to report that we find that the total expense for same, with the exception of railroad fare, will be about $45. This sum covering board and room and a small compensation to Mrs. Hawkins for the work this will entail upon her. We find that there will have to be perhaps 10 or 12 applicants at least to justify Mrs. Hawkins giving the matter her time. As there is nothing whatever in this for the Indianapolis Gas Company, and is a courtesy extended by them, members desiring to take advantage of their kind offer should, within the next 3 weeks, notify Mr. Graf. There will be no further communications or solicitations sent out by the Indianapolis Gas Company in regard to the matter.

D. ARTHUR BARNES,
S. E. MULHOLLAND,
J. M. OTT,
} Committee.

Discussion.

The President—Gentlemen, you have heard the report of the Committee. I do not know that any action is necessary. They have stated that no further communications in reference to this matter will be sent out by the Company. If you wish to avail yourselves of the opportunity here offorded you can communicate with the Indianapolis Gas Company within the next 3 weeks. Has any gentleman anything to say on the subject?

Mr. Barnes—I have nothing to say on the subject, only this: I think it would possibly be well for the members of the Association at least to let Mr. Graf know one way or the other. That would be common courtesy.

Mr. Thwing—I think it would be well for the Secretary of the Association to drop a line to the various gas companies telling them of this offer and advising them of these conditions. There are some members of the Association who are not present.

Mr. Barnes—I think the members will get this in the regular form of our booklet we send out, and Mr. Eves is a very busy man in his line, and all this unnecessary work put upon him I do not think is quite right. This is a free offer, and it is to our advantage. It is not to the advantage of the Indianapolis Gas Company and we should not ask too much of Mr. Eves.

Mr. Graf—Before Mr. Thwing got up I was going to make the suggestion that Mr. Eves communicate with those companies who are not represented at this meeting.

The President—Is that in the form of a suggestion, Mr. Graf, which will be carried out? I think a motion of thanks to the Indianapolis Gas Company would be in order.

Mr. Barnes—I make the motion, Mr. President. [Seconded.]

The President—It is moved and seconded that the Indianapolis Gas Company be thanked for their very generous offer. All in favor please rise. [All the members of the convention arose.] We are now under the head of general business. Mr. E. J. Walsh has asked permission to address us for a few minutes on the subject of

STANDARD GAS COAL.

Gentlemen of the Indiana Gas Association: Permit me to say a few words about coal, a product that represents the very life of your business, and which is the least appreciated and the most often condemned unjustly; for it seems that when results are not obtained, your first

thought is to blame it on the coal. Sometimes you may be right, for there are some plants that I know of using a coal that is better adapted for filling up holes, but more often the plant itself is at fault. Some gas companies will contract for mine run coal on account of the price, then will complain because they do not get a good preparation. Mine run, gentlemen, is just as it comes out of the mine, with no preparation whatever.

I have seen old experienced gas men pick two or three bad pieces of coal from a car and say to me, "Do you call that good coal?" I said certainly not, but you must not condemn the whole car just because you happen to find a few bad pieces in it, for we have men at our mines whose sole duty is to see that our coal is well prepared; but even at that a few bad pieces will get into a can occasionally.

Coal is one of nature's products, it is not like a poor manufactured article that can be improved upon; we have to take it just as it comes out of the ground, and instead of condemning it without good and sufficient reason, you should be more than thankful that nature has made so valuable a product to mankind, as good as it is.

Another complaint that we occasionally get is, that the car is short in weight when it arrives at its destination. Now we have no way of overcoming this, as every car is weighed at the mines by representatives of three interested parties, the operator, the miner and the railroad; so that between them all, the weight when the car leaves the mines must be pretty near correct. What may happen to the coal in transit I do not know, but I do know that there are several switch shanties between the mines and your plants that have stoves that are supplied with coal from passing cars, and the switchmen are not any too particular as to whose cars they are. Some of these stoves do business even in summer time, as you will see from the following story a superintendent of one of the railroads told me. He said he was down the road on an inspection tour one hot July day, and, stopping at a little switch snanty, he noticed that the stove inside was red hot. He said to the old Irishman in charge, "What in the thunder are you doing with a fire in that stove this time of year?" The old man replied, "Well, your honor, your clark sint me word last month that the company wouldn't furnish us with any more matches, and sure I have to have something to keep my pipe lit."

Continuing, gentlemen, would state, that what is known and recognized as the standard gas coal of this country is mined in Pennsylvania in what is known as the second pool district, and the analysis of same suffices to show why this coal ranks as the standard gas coal of the United States, and why other coals are classed as good or bad according to their approach to it. Here is represented the happy medium; no extraordinary yield of rich gas with a tremendous evolution of sulphur; no high percentage of volatile matter loaded down with an overbalancing burden of worthless ash. The volatile matter yields a fair return; the coke is plenty, clean and merchantable; the sulphur within limits that admit of its ready and cheap elimination; the ash, representing the residum of impurities, wonderfully low. In fact, if we must have sulphur and ash, as necessary evils, here they are to be found at a minimum. The uniformity of structure and analysis over the immense area of this bed of coal is wonderful. The exhaustion of thousands of acres, the driving of tunnels or entries for miles into and under the hills through the heart of the seam, brings to daylight and then to market, coal that is practically identical with that found at the beginning of operation. This persistance of chemical and physical structure is of no small importance to gas companies. It enables them to predict certain results in carbonization through a year's work or through a course of years. It gives them a constant as the base of their calculations, without which progress were impracticable.

We need not fear comparison here with our English cousins. Their best gas coals average about the same as our coal in volatile matter. In ash they average better than we do, not running much over 2 to 2½ per cent.; but in sulphur, the far more important consideration, they average about double that of our standard coal. While, as compared with the Provincial gas coal of this country from the Cape Breton district, we stand decidedly superior, both to quantity and quality of gas, and also in freedom from sulphur, the Provincial coals, containing nearly 6 times as much of the latter impurity; and, finally, we excel in greater yield of a superior quality of coke.

In conclusion, gentlemen, I want to ask you whose business it is to do the kicking, to kindly try to be a little more considerate hereafter with those who furnish you with standard gas coal, for they, I know, if only for their own peace of mind, try to do the very best they can to please you.

The President—Is there anything else to come before this Association under the head of general business?

The Secretary—Before we pass the motion to adjourn, I think we shall be justified in departing a little from our usual custom. We have been presided over during the last two years by one of the most respected and competent men in the gas business. As the founder and organizer, Mr. Dunbar has given the Indiana Gas Association his cordial support and uninterrupted work and the benefit of his valuable experience. I think we should be lacking in our duty at the expiration of Mr. Dunbar's term of office if we did not express our appreciation of those services by a rising vote of thanks. Those in favor please rise. [All the members arose.]

The President—Gentlemen, I assure you the pleasure of serving you as President has all been mine. the association has been delightful and the meeting with you has been one of the bright spots in my life. I think I heard Mr. Eves yesterday quote old King Solomon, who, in the declining years of his life, after having been blessed with wisdom as no man ever had been before, had all the necessaries of this world's goods to make him happy and contented, said, "All is vanity and vexation of spirit." Now, what I wish to convey by that is this, that any pursuit for mere happiness sake, engaged in with happiness in view as the ultimatum, is a mistake; that all our happiness, peace and contentment is the outcome of our associations in life. I assure you that the pleasant association that has been mine as President of the Indiana Gas Association has contributed more substantially to my happiness than any pursuit could have done. Gentlemen, I assure you it has been a pleasure and joy, and I hope to meet with you many years to come. Thank you all for your cordial support. [Great applause.]

Mr. Graf—Mr. President, this Association has extended its appreciation and thanks to its President and the officers of the Association. These, I believe, have been deserved; but I want to say that through my close association with Mr. Eves I know that fully 75 per cent. of the work of this Association has fallen on his shoulders. The success of this meeting has been largely due to Mr. Eves, and I would therefore move a rising vote of appreciation for the satisfactory and energetic maner in which Mr. Eves has performed his duties as Secretary-Treasurer of the Association. [Seconded.]

The President—I concur in every word Mr. Graf has said. I know of Mr. Eves' valuable services to this Association and it gives me great pleasure to put this motion, that Mr. Eves be thanked for the very efficient and satisfactory manner in which he has performed the duties of Secretary-Treasurer of this Association. All in favor of the motion please rise. [All the members arose.] Mr. Eves, it gives me great pleasure to give you this evidence of the appreciation in which you are held.

The Secretary—Allow me to express my sincerest thanks to Mr. Graf, Mr. Mulholland and the President, and to every member of the Association, for this vote of thanks. I can only say it has been a great pleasure and an honor to be the Secretary-Treasurer of an Association of this character. I should like to say that I wish every member of the Association prosperity in the coming year, and that if this Association can be in any way servicable to any member, or to their plant, they are at any time welcome to any assistance we can give. [Great applause.]

The President—Gentlemen, is there anything further? If not, a motion to adjourn is in order.

A Member—I move the Association adjourn. [Seconded.]

The President—It has been moved and seconded that we adjourn to meet in Fort Wayne next year. [Carried.]

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

951,363. Gas Grate Deflector. J. C. Calhoun, Kansas City, Mo.

951,501. Gas Generator. E. E. Hancock and C. F. Arnold, Philadelphia, Pa.

951,512. Oil Gas Apparatus. E. N. Percy, San Francisco, Cal.

951,633. Combined Dip Regulator and Tar Seal for Gas Apparatus. J. Dell, St. Louis, Mo.

951,665. Feeding Mechanism for Gas Producers. J. C. and J. A. Swindell, Pittsburgh, Pa.

951,693. Gas Heating Stove. A. C. Mott, Philadelphia, Pa.

951,710. Incandescent Mantle. M. Weickert, Plauen, Germany.

951,711. Volume Recording Attachment for Fluid Meters. H. P. Westcott, Erie, Pa.

951,778. Treatment of Coal Gas and Analogous Gases for Obtaining Tar and Ammonia. W. Feld, Honningen-on-the-Rhine, Germany.

951,767. Rotating Disk for Meters. A. G. Holmes, Pittsburgh, Pa., assignor to Pittsburgh Meter Company.

951,799. Method of Making Gas from Peat. P. J. Buckley, Waukesha, Wis.

951,828. Gas Burner. T. H. Mintier and H. J. Jennings, Texarkana, Ark., assignors to H. R. Segnar, same place.

951,856. Vertical Retort Gas Apparatus. J. H. Taussig, Philadelphia, Pa.

951,878. Safety Valve for Gas Stoves. W. J. Dolan, Indianapolis, Ind., assignor of two-thirds to E. J. Schmitt and F. W. Sharp, same place.

951,993. Means for Removing Free Carbon from Coal Tar. C. B. Lowry, Lexington, Ky., and R. Bernhard, Cudahy, Wis.; Security Trust Company, administrator of said Lowry, deceased; assignor to S. A. Fletcher, trustee, Indianapolis, Ind.

952,110. Gas Meter. E. S. Halsey, Lynn, Mass., assignor to General Electric Company.

952,127. Apparatus for Generating Gas from Oil. P. Meyer, Santa Rosa, Cal.

952,205. Gas Igniter and Extinguisher. J. C. Landers, Collegeville, Pa.

952,237. Gas Producer. M. E. Crowell, Franklin, Ind., assignor of one-half to F. F. Chandler, Indianapolis, Ind.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, March 10th, 1910.

Modern Conditions of Distribution.—Incandescent Mantles.—Distribution Problems.

The use of mechanical aids to the gasholder pressure is slowly but surely coming into the view of the practical horizon. And there are many reasons why we may expect that the advance in this direction will be accelerated year by year. There is the increasing demand for gas to be reckoned with. The remarkable expansion of our townships, the development of suburbs on the outskirts and the demand for a gas supply in outlying villages and townships. The tendency, especially in the suburbs of large cities, to amalgamate with adjoining undertakings. As an example of the extent to which this has taken place, it may be mentioned that the territory covered by the Aldershot District Gas Company is 128 square miles, and that occupied by the Croydon Gas Company 78 square miles. And last but not least, there is the fact that in these days of atmospheric burners and incandescent lighting the consumer is continually clamoring for more pressure; 12 to 15-tenths at the meter inlet is no longer sufficient, but he will have at least 20. The result is that many undertakings find that in practice, for a considerable portion of the year at any rate, the storage capacity is represented, not by the total holder capacity, but by that of the bottom lifts only. The top lifts are no use except during the hours of minimum consumption, a period now represented by about 6 hours out of the 24. Where we could, 25 years ago, count on the period between midnight and dusk on the next day, as a time for accumulating stock, we now find that there is a steady demand from 6 A.M. to 12 P.M. Apart from the expense of enlarging the mains in the principal streets, the increasing demand on the subsoil renders such a step absolutely impossible. I have heard of instances where the only way of saving the situation was to run leading trunk mains by circuitous routes through by streets. It is evident that boosting and high pressure distribution are becoming a necessity of the age, and, fortunately, apart from questions of necessity, the new plan can make a very good showing, when regarded as a means of efficient and economical distribution, as compared with the old.

Particular interest therefore attaches to a description of pressure raising plant at Tynemouth, contributed to the current number of the *Journal of Gas Lighting*, by Mr. William Hardie, engineer of the Tynemouth Gas Company. A district gasholder of 200,000 cubic feet capacity was formerly connected to the works by an 18-inch main about a mile in length. The holder, having been in regular use for 45 years, was in need of extensive repair, or replacement by a larger one. After full consideration, it was decided that, as this would be unsatisfactory and costly, and the enlargement of the 18-inch main was impracticable because the whole length of it was situated in a narrow, busy street, the whole subsoil of which was occupied by other conduits, tram lines, etc., the increase of the pressure at the inlet end of the 18-inch pipe was the best means to adopt. A power house was therefore erected, fitted with gas engines, dynamos, motors and blowers, all in duplicate, safety by-pass governors, and the necessary connections and valves. The engines, etc., are so arranged that they can be worked independently as separate units, or either one engine can be coupled up to both blowers. Each engine is 19 B. H. P. of the national gas engine improved Otto type, with one heavy fly-wheel, balanced crank and self starter. The dynamos are compound wound, of the protective type, and each will generate 11 kilowatts at 250 volts, when running at 920 revolutions per minute. The blowers are the James Keith & Blackman Company's No. 5 narrow type, having a fan secured to the main shaft and working in a cast iron outer casing. The safety governors are of the Parkinson and Cowan type, and in the event of stoppage of the blower, or other obstruction, would automatically open and put on a full way supply from the inlet, to the district. Each blower is specified to be capable of passing 200,000 cubic feet of gas per hour, and of boosting the pressure to the extent of 13 inches, viz., from 5 inches at the inlet to 18 at the outlet. The results of an experiment show that with one motor running at 2,800 revolutions per minute the B. H. P. required was 14.2, the pressure was raised from 3.7 inches at the inlet to 16.7 at the outlet, the quantity of gas delivered was 190,760 cubic feet per hour, and the terminal pressure 6 inches. The arrangement has been in actual work for 3 months, and with satisfactory results.

There is no single item of the purchase department of a gas undertaking, that requires so much consideration as the incandescent mantle, which is now recognized as the sheet anchor of the lighting business. It is not so very long ago that the mantle was an unknown factor in the gas works, or that it was looked upon as an impracticable novelty that need not be seriously considered. But to-day there is scarcely a gas undertaking throughout the country that is not interested in the question of what is the best, not necessarily the cheapest as regards price per gross, but the article that can show a long life and will retain a good shape to the end. There is nothing remarkable, therefore, in the fact that the London and Southern District Junior Gas Association should devote some time to the consideration of this interesting topic. First they had a visit to the works of the Voelher Lighting Corporation, where the whole process of manufacture was seen in operation. And then they assembled to hear and discuss a paper by Mr. Percy G. Somerville, of the Chief Inspector's department of the Gas Light and Coke Company. There was a time when the officials of this large undertaking were not encouraged to identify themselves with Association work, but a more enlightened policy now prevails, with the result that these gentlemen are taking a place in the profession that is worthy of those who serve the largest concern in the Kingdom. The author gave a historical review of the subject, and also described the manufacture of the collodionized mantle, but the special feature was a description of the procedure in respect to the non-collodionized mantle, as lately adopted by the Gas Light and Coke Company. It is known that the use of collodion is not necessary so far as the actual work or life of the mantle is concerned, but is an incidental treatment adopted for the purpose of facilitating carriage and minimizing breakages. It confers a certain amount of elasticity that resists shaking or jolting, but as soon as the mantle is put into position for use the first thing is to burn off the collodion. The Gas Light and Coke Company buy the mantles in the limp condition, the woven fabric having been dipped and impregnated with the necessary chemicals, and perform the operations of firing, hardening, seasoning, shaping, trimming and packing, themselves. The non-collodionized mantles are packed in glass cylinders in preference to the usual cardboard boxes, and these cylinders are carried in specially designed drawers and cases. The cylinders can be used over and over again for a very long time, and offer the advantage that the mantle is open to inspection at any time. With the dipped or collodionized mantles, pin holes or other slight defects are concealed and do not become evident until the mantle is burnt off, but this does not apply to the uncoated article, as the glass cylinders facilitate a system of inspection, by which any defect or negligence in manufacture can be located and traced to its source. It has also been observed that mantles are injured by roughnesses on

the surface of the interior of the cardboard case. The Gas Light and Coke Company are at present making up 10,000 mantles per week, with a staff of 7 girls. An interesting discussion followed the reading of the paper. It was observed that only the largest concerns could entertain the question of preparing their own mantles. Mr. J. G. Clark referred to the testing of mantles, and said that a satisfactory article should give durability, efficiency and strength. A mantle should be burned for a number of hours and watched for structural defects or shrinkage. The photometrical test might be taken after 50 to 100 hours' burning. And the strength might be tested by means of the Woodall-Moon machine. In the course of a reply, Mr. Somerville said that apart from other advantages the money saving effected by the use of non-collodionized mantles was about 3s. per gross. The special cases for taking out the mantles comprised drawers partitioned to exactly fit the glass tubes, and boxes suspended from strong spiral springs, in a frame fitted up in an ordinary one-horse van. Several other interesting details were also explained and discussed.

Some discussion has lately appeared in the columns of our technical press on the subject of the flow of gas through pipes, having regard, of course, to the delivery per hour under known conditions of length, diameter and initial pressure. It is evident that considerable difference of opinion exists as to the accuracy of the published tables based on Dr. Pole's formula. One eminent distributing engineer has found them fairly accurate, while another has adopted data from which it would appear that they are excessive and that the actual delivery in practice is much less than that arrived at by theory. The variable results obtained by those who have made experiments goes to show that the delivery is substantially affected by the working conditions, such as the nature of the interior surface of the pipe and the accuracy of the bore, and probably by the composition of the gas, the percentage of moisture present and other conditions that would affect the coefficient of friction or the contact hindrance of the flow. It is suggested that just as there are back eddies at the banks of a river, which increase in size and importance with the velocity, so there are eddies at all points of the circumference of a circular conduit. Another way of explaining the contact hindrance is by the statement that at the circumference the flow is stationary or nearly so. In either case the practical result is that the working diameter of the pipe is smaller than the actual diameter. There is an annular section of unknown width that is doing no useful work, or perhaps the flow is more rapid at the center and tapers off towards the circumference. In this connection it is interesting to remember that the supply is in all cases taken from the circumference, never from the center. The services and branches are all attached to the circumference. The passage of the gas, say from a 6-inch main to the inlet connection of a 1-inch service, may, therefore, of itself involve a certain loss of pressure. Another remarkable thing is that while according to the above consideration the delivery should be found to be less at high pressures, as compared with theory, this conclusion is not supported by the practical results. The viscosity of the gas is affected by atmospheric conditions of temperature and pressure, and most practical men will agree that at times these conditions are more favorable than at others. At a temperature of 65° F. and a pressure of 30 inches distribution is more active on the same system of pipes than at 32° and 28 inches.

Another point on which some confusion exists is the question of terminal pressure. Experiments may be conducted with one end of the pipe open to the atmosphere—*i. e.*, with no terminal pressure, but in actual practice there must be a terminal or take-off pressure of about 20-tenths. But it is a very simple matter to add the terminal pressure, whatever it may be, to the initial pressure. The initial pressure must always equal the distributing plus the terminal. If the terminal pressure is 20-tenths and the distributing pressure 10-tenths, then the initial pressure must be 30-tenths, and the distributing pressure will be 10-tenths, independently of the terminal. Variations in the terminal pressure do not affect the calculation, as a pipe that delivered a given quantity at 10-tenths with an open end—*i. e.*, a terminal pressure of zero, would deliver an equal quantity at 30 tenths with a terminal pressure of 20. It is to be hoped that the result of the discussion will be evident in some practical experiments on a sufficiently extensive scale, embracing several sizes and lengths of pipe, and including all the varieties in actual use, not only cast iron pipe, but wrought iron and steel. One should also consider the effect of various kinds of joints, such as ordinary socket and spigot joints, which make a decided break in the continuity of the interior surface, and butt joints with screwed sockets that preserve a practically unbroken contour.

Items of Interest
FROM VARIOUS LOCALITIES.

Mr. L. H. Conklin, recently General Manager of the Scranton (Pa.) Electric Company, has been engaged as an engineer in the Operating Division of Messrs. J. G. White & Company, of New York. That Mr. Conklin is well qualified for the duties of his new attachment would seem proven from this synopsis of his career in engineering work. He graduated from the Pratt Institute, Brooklyn, N. Y., in the Class of 1891, and at once engaged in practical work in shops and in general construction work in New York and in Massachusetts. His first important position was with the Excelsior Electric Company, of Brooklyn, which he served successively as draughtsman, erecting engineer and assistant superintendent. From 1896 to 1900 he was superintendent of the electric division of the Flatbush Gas Company, Brooklyn, N. Y., and in 1900 to 1904 was the junior member in the Brooklyn contracting firm of Weiderman & Conklin. In 1904–05 he was engaged in the construction and operation of a boring mill in North Carolina. In 1905 he was retained by the large lighting interests in New England controlled by the A. M. Young syndicate, with headquarters in Waterbury, Conn. This connection proved a very busy one, for during the continuance thereof he either built or remodelled several important electric properties, notably those in New London, Rockville and Stafford Springs, Conn., and it was under his direction that the electric railroad between Waterbury and Woodbury was constructed. He served the West Penn Railway's Company, of Pittsburgh, Pa., from 1907 to 1909, and was General Manager of the Scranton (Pa.) Electric Company from that time to the present. He is a Past-President of the Pennsylvania Electric Association, is a member of the American Institute of Electrical Engineers, and an *ex-officio* member of the Executive Committee of the National Electric Light Association. His personality is of the pleasing sort, and the Messrs J. G. White & Company have added to their well organized staff a member that will do credit to them while adding to his own fame on the lines of his chosen profession.

The annual report of the New York and Queens County (Long Island) Electric Light and Power Company, respecting its operations for the year 1909, shows that it earned the net sum of $317,086, as against $281,278 for the preceding twelvemonth. The Company, if we mistake not, controls all of the electric lighting companies in Queens County save that at Far Rockaway, which is controlled by the gas suppliers of that famed summer resort.

If the statement recently made by its promoters is true (and there is no reason of which we have cognizance that any mistake has been made in the assertion), 90 per cent. of the business concerns doing trading in Gadsden, Ala., have signed contracts with the Tri-Cities Gas Company—referring, of course, to the houses or shops that front on paved streets. It is believed that gas will be turned on some time during next month.

Mr. John Heathcote, Treasurer of the Russell Electric Manufacturing Company, of Providence, R. I., died at his home in that city the afternoon of the 14th inst., he was in his 77th year, having been born in Manchester, England, in 1833. His parents emigrated to this country in 1842, settling in Providence. Deceased was well known to the gas trade of New England in the early seventies through his connection with the firm of Barbour & Heathcote, who were extensive dealers in gas piping for services together with the fittings, etc., necessary thereto.

The Superintendent of Streets, Boston, Mass., is advertising for bids for the lighting of the public streets and alleys with gas, for a term running from the first of August next.

The residents of Rodale, Ills., are insisting that the Western United Gas and Electric Company shall practically exercise its franchise right to pipe the streets of that settlement for a supply of gas there through.

The Water and Light Committee of the City Councils, of Wheeling, W. Va., by the decisive vote of 5 to 1, has recommended to Councils the plans submitted by Mr. W. A. Baehr for the reconstruction of the city gas works. According to his figures the works proper will cost $70,000, and the distribution changes advised will entail a further expenditure of $40,000.

ADVICES from Boone, Ia., are to the effect that Col. E. G. Pratt, President of the Boone Gas Company, has sold (or parted) with the franchises under which he and his associates proposed to construct a gas works in Ames, Ia. The purchasers are the Tenney Brothers, of Newton, Ia., who are the controlling factors in the American Construction Company.

THE Fall River (Mass.) Gas Works Company has purchased the plot on the east side of North Main street, just north of the site occupied by the Fall River Savings Bank. The plot comprises 36½ rods of land, and it is proposed to eventually construct thereon a handsome office building, entirely for its own use. While the plans have not been actually prepared, and although it is certain, construction work will not be commenced this year, it is a certainty that the building will be one of the handsomest business edifices in this busiest of "Spindle Cities."

THE special gas committee of the New Bedford (Mass.) City Council, after much tinkering, in which several irons were handled by that celebrated gas expert (Professor W. D. Marks), recommended among other things that the gas must have a heating value equal to 600 British Thermal Units, tested at a point not less than 1½ miles from the works—this is on a parity with the Wisconsin practice. The Professor did not haggle greatly over the heat unit value, but he was very strong over the pressure lines. The Professor favored something like 2 inches, while some of his associates seemed to think the limit should be 6 inches. A disinterested party suggested that possibly an average could be so struck if the slide rule were brought into play; but, of course, that was all suggested in a spirit of levity.

THE new gas rates in Fall River—85 cents on private and 65 cents (cubic feet, of course) on public account become effective the 1st prox.

THE Western Gas Construction Company is out again with another series of its useful desk blotting pads. It is a beauty, of a certainty.

"THE residents of Houston Heights, an adjoining settlement of Houston, Tex., are anxious to have gas; but it is not likely their wishes will be satisfactorily met until either the Taylor or Bennett faction receives its quietus. Mayhap they could come together, and thus solve the problem." So writes "R. T. L.," under date of the 15th inst.

THE Dempseytown Gas Company, of Pittsburgh, Pa., with main place of operation in Venango county, Pa., has been incorporated by Messrs. F. J. Kier, Paul Kelliam, M. C. Mullen, M. A. Furlong and M. R. Chubbuck, all of Pittsburgh. It is capitalized in $100,000.

ADVICES from Salt Lake City, Utah, are to the effect that the demand there for gas has increased to such an extent that the proprietors of the Utah Gas and Coke Company have decided to double the generating capacity of the present plant. Not only so, but it may also be said that the main system will be increased by the placing of several miles of pipes. The proposition, as to the generating end of the determination, will enable the Company to easily put out 2,000,000 cubic feet per day.

THE proprietors of the Amherst (Mass.) Gas Company have awarded to the Cruse-Kemper Company a contract for the installation of a complete gas plant, comprising generating, purifying, metering and storage apparatus. The plant will be built on the new location purchased some time ago, and Sales Engineer Mayers informs us that the agreement calls for the completion of the work early this summer.

MR. W. H. FRITCHMAN, Manager of the Brockport (N. Y.) Gas Light Company, reports that since he assumed active control of the works these have been vastly bettered. The additions include a new bench of 6's, operated under the Improved Equipment Company's system, a No. 3 Roots' exhauster and engine, and a new steam plant, plus a blower. The buildings have been re-roofed, and the by-product equipment includes a tar tank up to holding 4,000 gallons—by the way, those in search of an extra grade of coal gas tar might do well to communicate with Manager Fritchman, who has quite a quantity of such for sale. As soon as the weather conditions show the actual arrival of spring it is proposed to start the placing of 1½ miles of main pipe.

THE construction changes and additions to the Portsmouth (N. H.) Company's works were satisfactorily completed about a fortnight ago. The work done as to apparatus placed included a complete exhausting, condensing and scrubbing plant, tar extractor, exhauster and engine, etc. The engineering direction was in the capable hands of Mr. Edward Lybolt, assisted by Mr. C. W. Eustace.

THE Tacoma (Wash.) Gas Company's proprietors have now satisfactorily determined that no mistake was made when the determination to extend the system to and through the Puyallup district was reached.

THE Dunn Stoker and Water Gas Furnace Company has been incorporated by Messrs. Leslie Dunn, Walter M. Thorn and John H. Ryder, with headquarters in Newark, N. J. It is capitalized in $125,000.

MR. W. L. COSGROVE, who for many years was the active spirit in the management of the Atlanta (Ga.) Gas Light Company, has been appointed Manager of the Grant Construction Company, which concern erected the beautifully planned structure and office building, Marietta and Broad streets, Atlanta, which is to be the new home of the Third National Bank of that city.

MENTION of Atlanta recalls the fact that work on the new storage holder (to retain 3,000,000 cubic feet) for the Atlanta Gas Light Company is well underway.

MR. J. J. DONELAN, Superintendent and Manager of the Waverly (Ia.) Gas Company, is interested with others in the proposition to build and operate a gas works in the thriving Iowa settlement known as Decorah.

MR. B. A. WARD, of Memphis, Tenn., and associates are proposing to construct gas works in Mayfield, Ky. It is said that the necessary money ($30,000) to go on with the task has been subscribed.

IT is said that the business of supplying gas and electric currents in the city of Santa Rosa, Cal., was carried on last year at a net loss in operation of $6,715.75. This result occurred on a total gross receipt of $115,023.54, of which amount gas sales were accountable for $47,445.35. The proprietors are getting ready to ask for consent to increase the rates on sales account, especially in respect of the electrical service.

JUST think of it. Here is the proposition of the youthful Wyncote (Pa.) Gas and Electric Company planning to expend $10,000 on enlargement account.

THE Western Gas Construction Company desires us to note that it has on hand, and ready for immediate delivery, valves ranging from 3-inch to 20-inch.

WE have received the bound volume containing the "Proceedings" of the 18th Annual Meeting of the Michigan Gas Association, also, the book of "Proceedings" of the meeting of the Indiana Gas Association, held last January.

MR. OTTO RICE, of New Haven, Conn., who took service with the Norwalk (Conn.) Gas Company in 1908, has been appointed to the responsible position of General Foreman of the street department division of the Newark and Orange branches of the Public Service Corporation of New Jersey.

JUDGE DOBLER, setting in Part II., Circuit Court, Baltimore county, Md., has decided that the Consolidated Gas, Electric Light and Power Company, of Baltimore city, has the right to issue about $7,000,000 of bonds, under the mortgage of the old Company, dated April 1, 1904, for the purpose of refunding and retiring underlying bonds of the Gas Company. He also upheld the validity of the bonds issued since the consolidation.

THE Warsaw (Ind.) Gas Company intends to enlarge its capacity by the addition of a 100,000 cubic foot holder.

THE Britilite Company, New York city, has been incorporated at Wilmington, Del., to manufacture and deal in gas mantles and fixtures. The capital stock is to be $200,000.

THE Gas Machinery Company have been awarded the contract for a 5-foot water gas apparatus and miscellaneous machinery by the North Carolina Public Service Company, of Greensboro, N. C. This is only one of many improvements which General Manager E. C. Deal has under way.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

MONDAY, MARCH 28, 1910.

The Market for Gas Securities.

Dullness and weakness were the prevailing characteristics of the share market during the last week of the lenten season. The course of the market was rather odd in that money, both on call and time, was plentiful. However there can be little doubt that the pervading cause of the dullness is lack of confidence. True, business, speaking generally, is voluminous, and the conditions point to a continuance of activity right through the spring season, yet accounts are being collected in regular way, and credit when extended is really no credit from a speculative standpoint. On the whole, perhaps the current state of affairs is best for all concerned.

Consolidated closed yesterday (Thursday) at 144 bid. Laclede gas hovers around par, and Peoples, of Chicago, shows no change of moment. Brooklyn Union remains unchanged, and a like remark applies to Washington, D. C.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

MARCH 28.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	144¼	144½
Central Union Gas Co. — 1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.— Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	2,500,000	100	155	165
New Amsterdam Gas Co.— 1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River— 1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union— 1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	150	155
1st Con. 5's, due 1948, M. & N.	15,000,000	—	95	99
Yonkers	999,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	.65	.70
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,860,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	20,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90¼	91
Preferred	3,036,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	-	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	100	100½
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co. " 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	81	81¼
Preferred	25,000,000	100	96	96½
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	109½	110
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.— 1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	101
Washington (D. C.) Gas Co.	1,600,000	200	355	356
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	361	—

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(*Continued on page 594.*)

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., March 9, 1910.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1910, to stockholders of record at the close of business, March 31, 1910. Checks will be mailed.

1814-5 LEWIS LILLIE, Treasurer.

Position Wanted.

All-Round Gasfitter, Complaint and Welsbach Man.

Can furnish best of references.

1816-1 Address, "W.," care this Journal.

Position Wanted

As Superintendent of a Gas Plant,

By middle aged man. Has had years of experience in both coal, water gas and electricity in cities of 100,000 population. Can handle any part of the business, in office, manufacturing, construction and distribution. Perfect satisfaction given where employed. Best of references.

1816-1 Address, "A. G. L.," care this Journal.

WANTED,

A First-Class Draftsman, Accustomed to Gasholder Construction, Gas Apparatus and Structural Work.

State experience and salary expected.

1816-1 Address, "K. K.," care this Journal.

WANTED,

A Competent Gas Maker for Plant in Pennsylvania.

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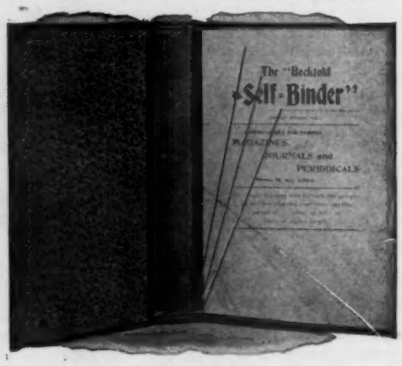

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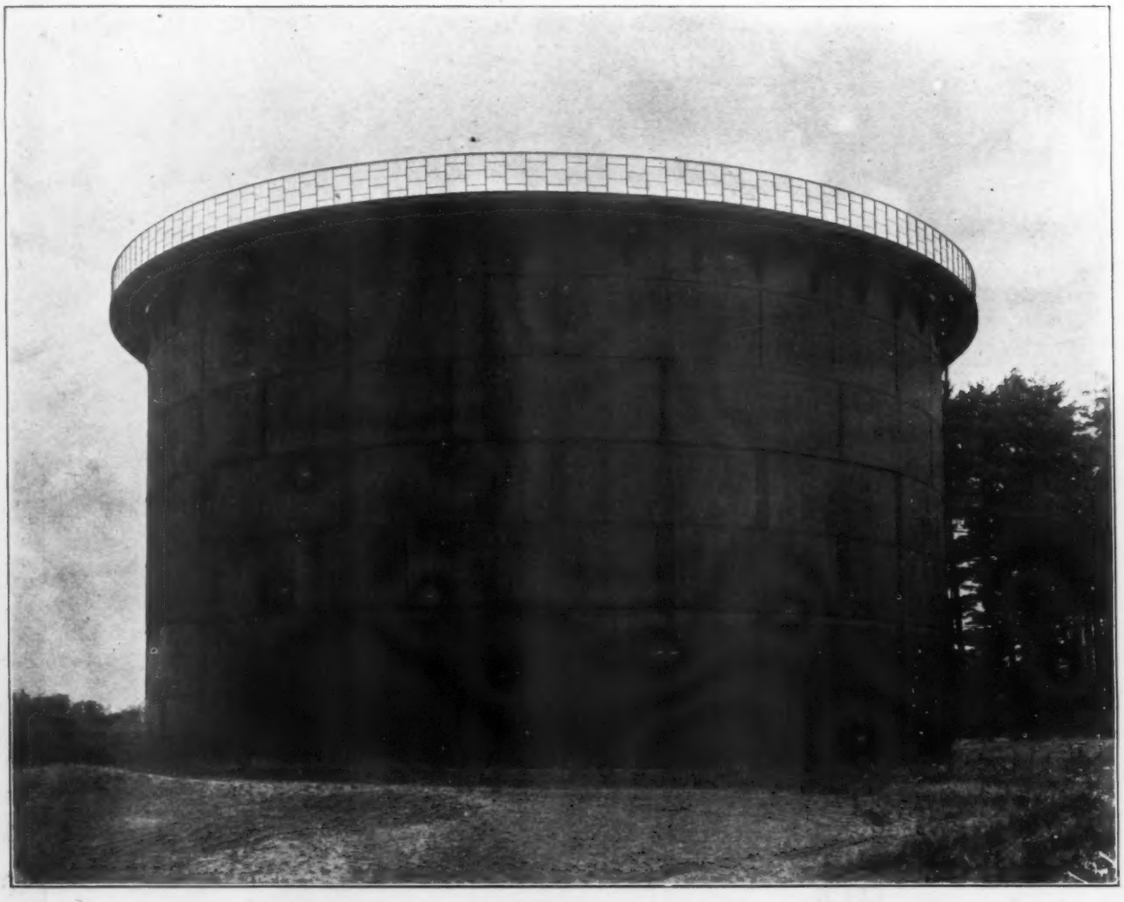

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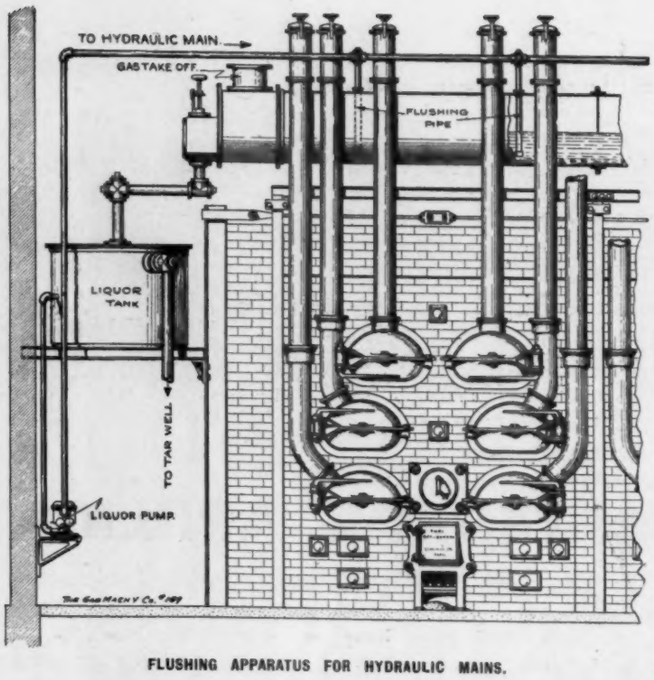

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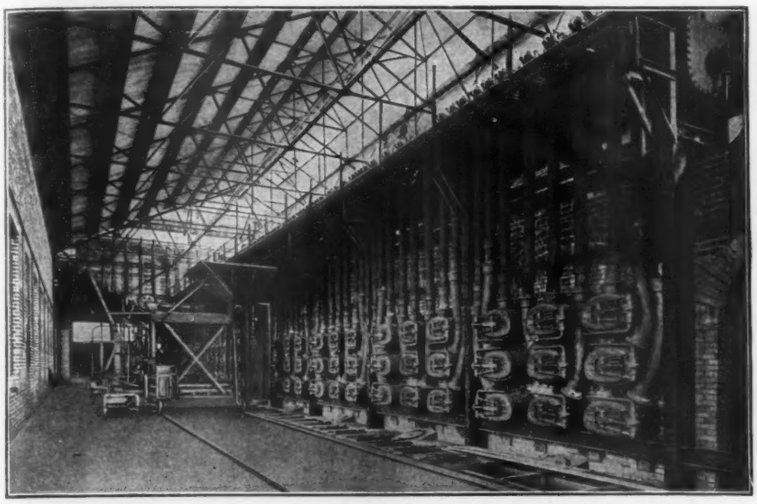

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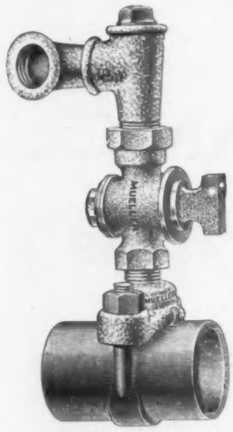

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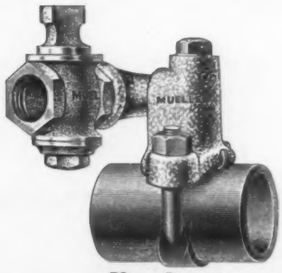

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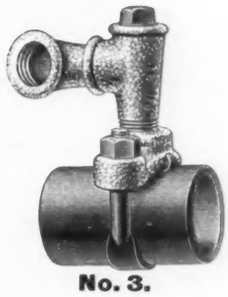

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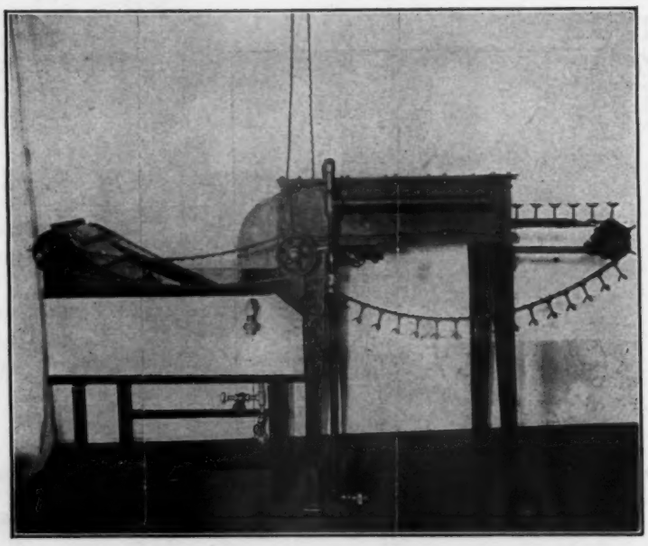

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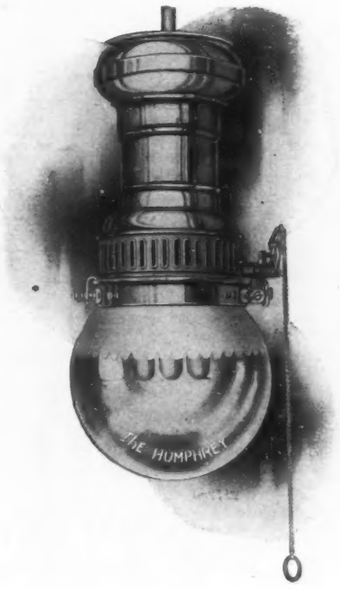

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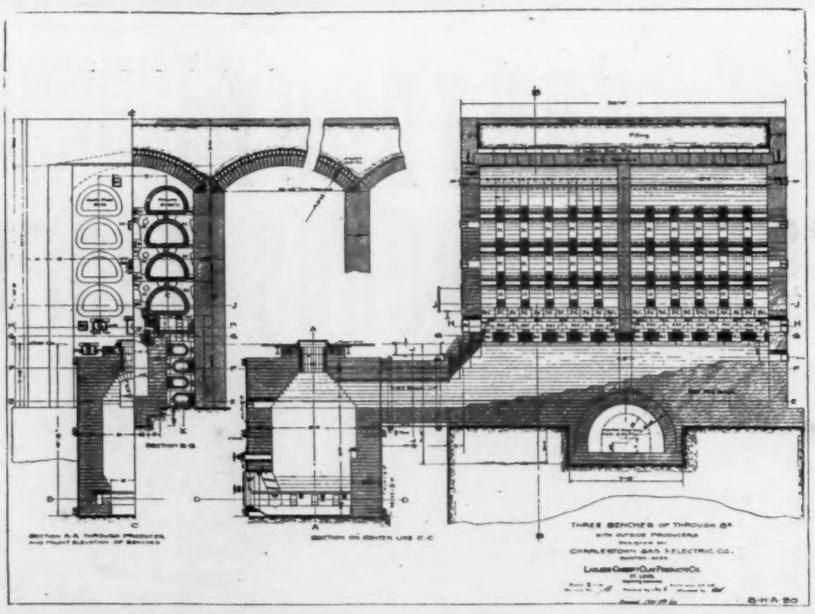

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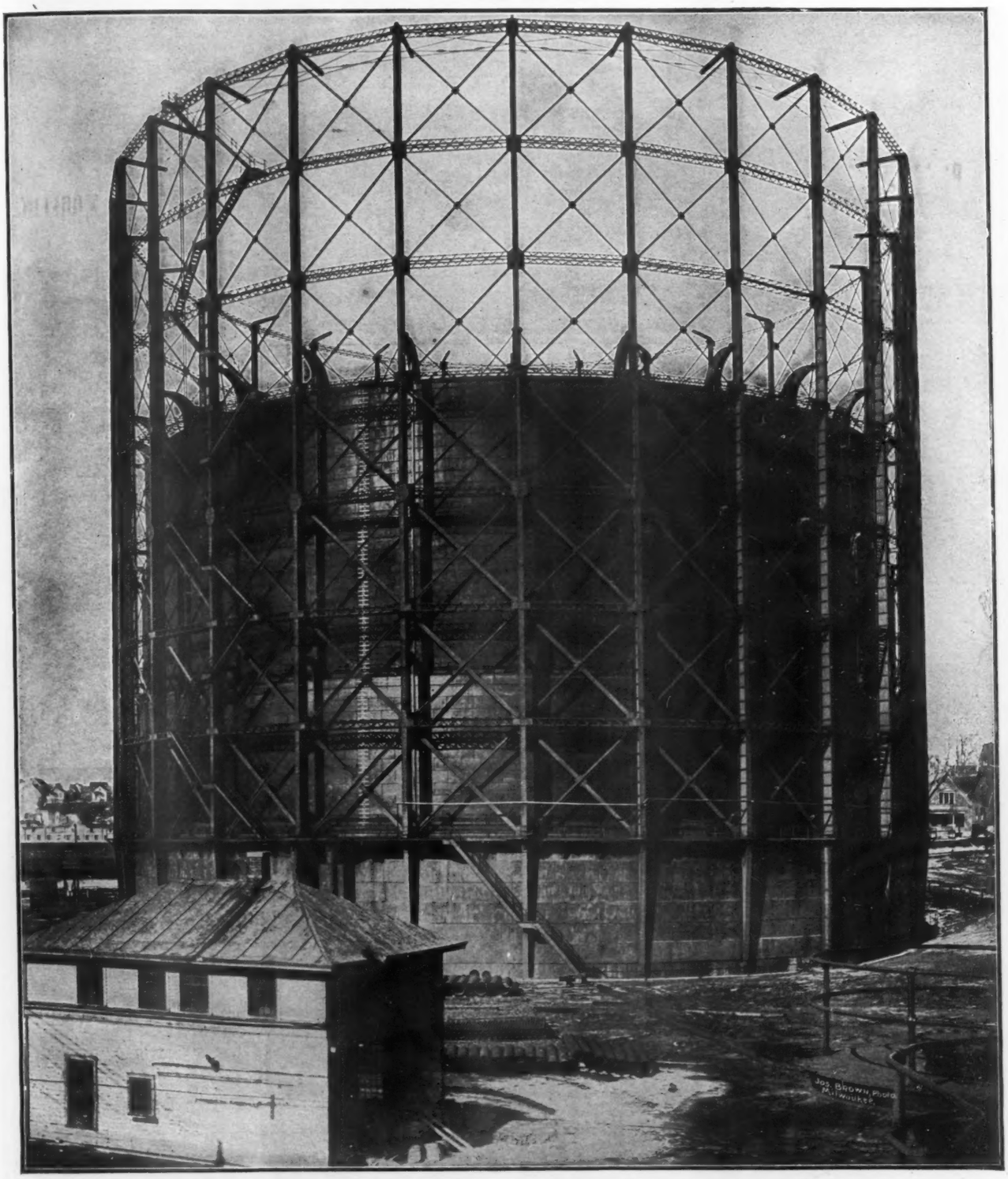

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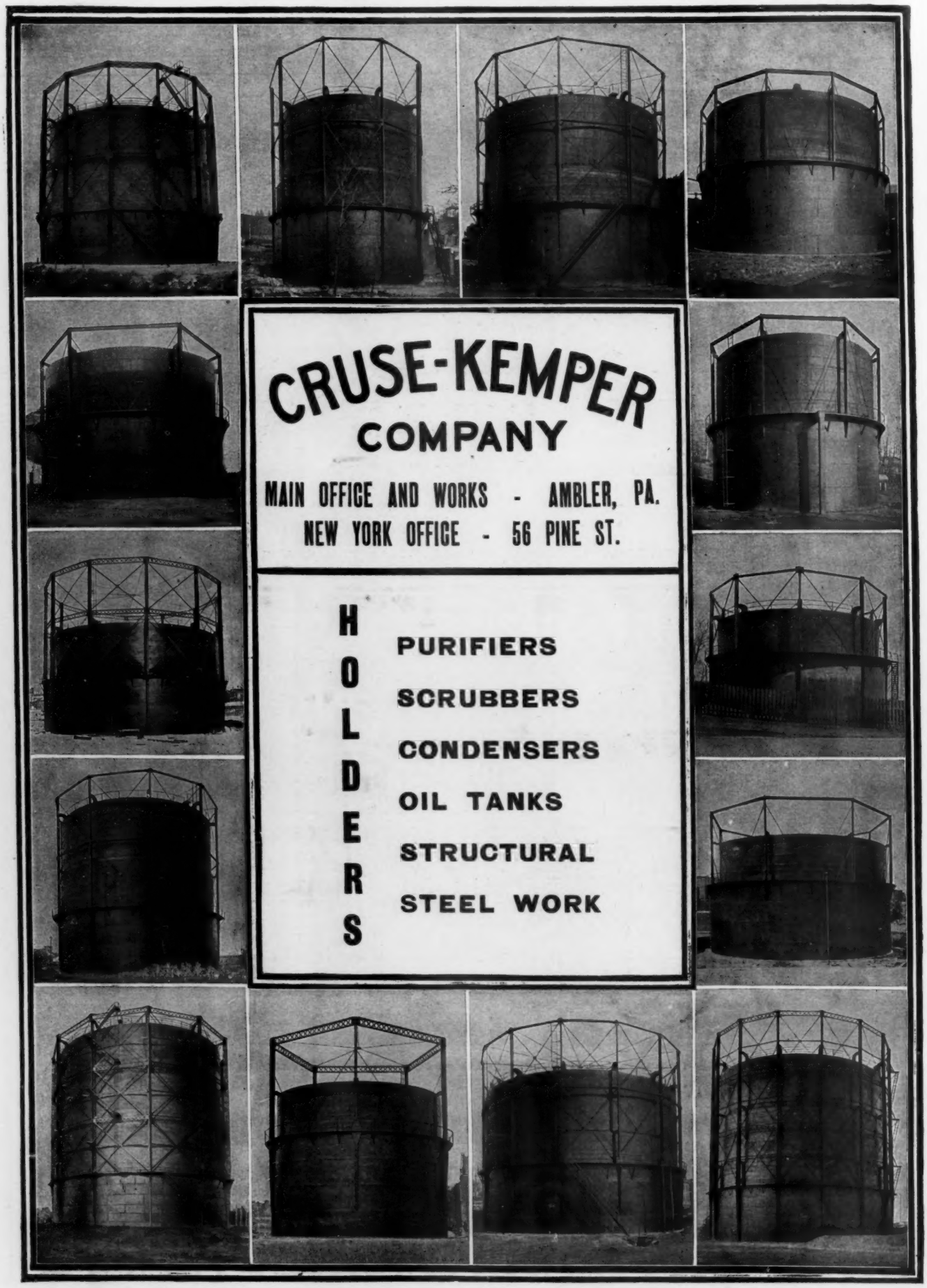
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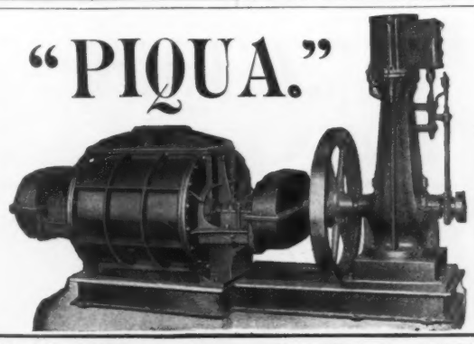

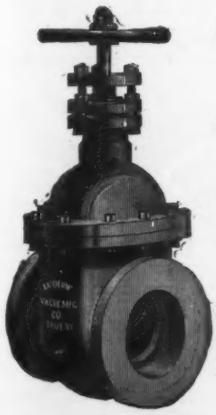

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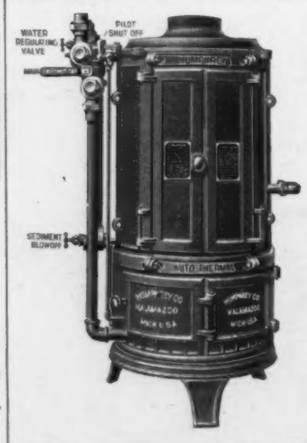

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						From Time Given.	
		P.M.				P.M.	A.M.
Fri.	1	6.50	2.10 A.M.	Fri.	1	5.57	4.47
Sat.	2	6.50 L.Q.	3.10	Sat.	2	6.07	4.37
Sun.	3	7.00	3.50	Sun.	3	6.07	4.37
Mon.	4	7.00	4.30	Mon.	4	6.07	4.37
Tue.	5	7.00	4.30	Tue.	5	6.07	4.37
Wed.	6	7.00	4.30	Wed.	6	6.07	4.32
Thu.	7	7.00	4.30	Thu.	7	6.07	4.32
Fri.	8	7.00	4.30	Fri.	8	6.07	4.32
Sat.	9	7.00 N.M.	4.30	Sat.	9	6.17	4.22
Sun.	10	7.10	4.30	Sun.	10	6.17	4.22
Mon.	11	7.10	4.30	Mon.	11	6.17	4.22
Tue.	12	7.10	4.30	Tue.	12	6.17	4.22
Wed.	13	7.10	4.30	Wed.	13	6.17	4.22
Thu.	14	11.40	4.30	Thu	14	6.17	4.22
		A.M.					
Fri.	15	12.40	4.30	Fri.	15	6.17	4.22
Sat.	16	1.20 F.Q.	4.30	Sat.	16	6.27	4.17
Sun.	17	2.00	4.20	Sun.	17	6.27	4.17
Mon.	18	2.30	4.20	Mon.	18	6.27	4.17
Tue.	19	3.00	4.20	Tue.	19	6.27	4.12
Wed.	20	3.20	4.20	Wed.	20	6.27	4.12
Thu.	21	3.40	4.20	Thu.	21	6.27	4.12
Fri.	22	4.00	4.20	Fri.	22	6.27	4.12
Sat.	23	No L.	No L.	Sat.	23	6.37	4.02
Sun.	24	No L. F.M.	No L.	Sun.	24	6.37	4.02
Mon.	25	No L.	No L.	Mon.	25	6.37	4.02
Tue.	26	7.20 P.M.	10.00 P.M.	Tue.	26	6.37	4.02
Wed.	27	7.20	11.10	Wed.	27	6.37	4.02
Thu.	28	7.20	12.10 A.M.	Thu.	28	6.37	4.02
Fri.	29	7.20	1.00	Fri.	29	6.37	4.02
Sat.	30	7.20	1.50	Sat.	30	6.47	3.52

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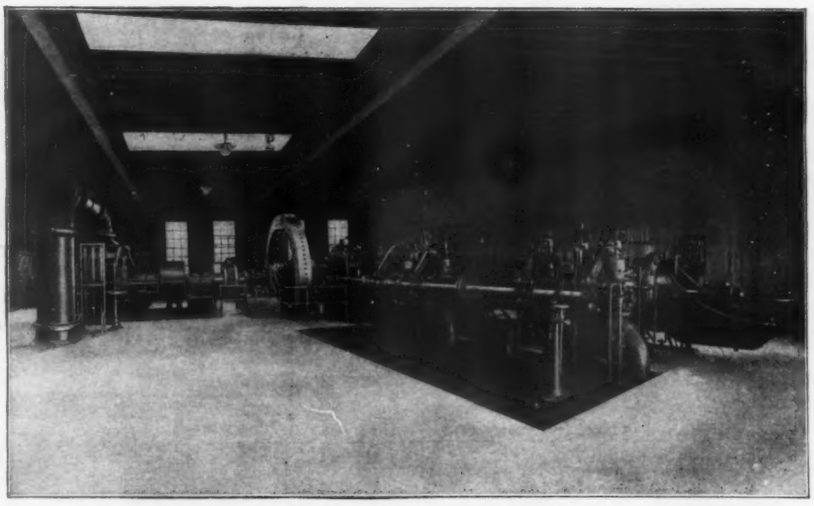

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American Gas Institute.—Annual meeting, October, 1910. New York City. Officers: President, Wm. H. Bradley, N. Y., City; Secretary, A. B. Beadle, 29 West 39th street, N. Y. City.

Canadian Gas Association.—Annual meeting, June, 1910. Hamilton, Ont Officers: President, J. S. Norris, Montreal, P. Q.; Secretary and Treasurer, A. W. Moore Woodstock, Ont.

Empire State Gas and Electric Association.—Annual meeting, Nov., 1910. New York City. Officers: President, C. R. Huntley, Buffalo, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Guild of Gas Managers of New England.—Annual meeting, December. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, A. E. Quinn; Newport, R. I.; Secretary, Walter G. Africa, Manchester, N. H.

Illinois Gas Association.—Annual meeting, time, March, Chicago, Ills. Officers: President, A. S. Harrington, Chicago, Ill.; Secretary-Treasurer, C. B. Strohn, Elgin, Ill.

Illuminating Engineering Society.—Annual meeting, January —, 1911. Meetings of Sections, monthly. President, W. H. Gartley, Philadelphia, Pa.; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York: Secretary, Albert J. Marshall, 227 Fulton street, New England, Secretary, L. D. Gibbs 39 Boylston street, Boston, Mass. Philadelphia, Secretary, F. N. Morton, Broad and Arch streets Chicago, Secretary, T. R. Beebe, 157 Michigan avenue,

Indiana Gas Association.—Annual meeting, January 19, 1911, Fort Wayne, Ind. Officers: President, Carl H. Graf, Indianapolis; Vice-President, S. E. Mulholland; Secretary-Treasurer, Philmer Eves, Indianapolis Gas Company, Indianapolis, Ind.

Iowa District Gas Association.—Annual meeting, time, June 23, 24, 25, 1910, Sioux City, Ia. Officers: President, Geo. H. Waring, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, ———— Wichita, Kas. Officers: President, W. A. Scothorn, Hutchinson, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, time, September, 1910; ———— Officers: President, B. O. Tippy, Grand Rapids, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 14, 15 and 16, 1910; Jefferson City, Mo. Officers: President, W. A. Bixby; Secretary and Treasurer, C. L. Clary, Sikeston, Mo.

National Commercial Gas Association.—Annual meeting, December, 1910: Boston. Officers: President, E. N. Wrightington, Boston; Secretary, Louis Stotz, 36 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May 17, 18 and 19, 1910; Oklahoma City, Okla. Officers: President, William H. McKenzie, Kansas City, Kas.; Secretary, T. C. Jones, Delaware, O. Editor Wrinkle Department, F. W. Stone, Ashtabula, O.

New England Gas Association.—Annual meeting, third Wednesday in February; Boston. Officers: President, W. H. Snow, Holyoke, Mass.: Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

Oklahoma Electric Light, Railway and Gas Association.—Annual meeting, May 18, 19 and 20, 1910; Oklahoma City. Officers: President, F. H. Tidman, Oklahoma City, Okla.; Secretary-Treasurer, Galen Crow, Guthrie, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. 20, 21 and 22, 1910, Los Angeles, Cal. Officers: President, W. B. Cline, Los Angeles, Cal.; Secretary-Treasurer, John A. Britton, 925 Franklin street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April 13, 14 and 15, 1910, Easton, Pa. Officers: President, E. G. Holzer, Easton, Pa.: Secretary-Treasurer, William H. Merritt, Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, December, 1910; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 1123 Broadway, New York.

Southern Gas Association.—Annual meeting, Feb. 16, 1911, Montgomery, Ala. Officers: President, H. W. Frund, Salisbury, N. C.; Secretary-Treasurer, Jas. Ferrier, Rome, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. ————, 1910, Beaumont, Tex. Officers: President, R. B. Stichter, Dallas, Tex.; Secretary's office, 300 Commerce street, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 11 and 12, 1910, Milwaukee, Wis. Officers: President, R. B. Brown, Milwaukee, Wis.; Secretary-Treasurer, H. H. Hyde, Racine, Wis.

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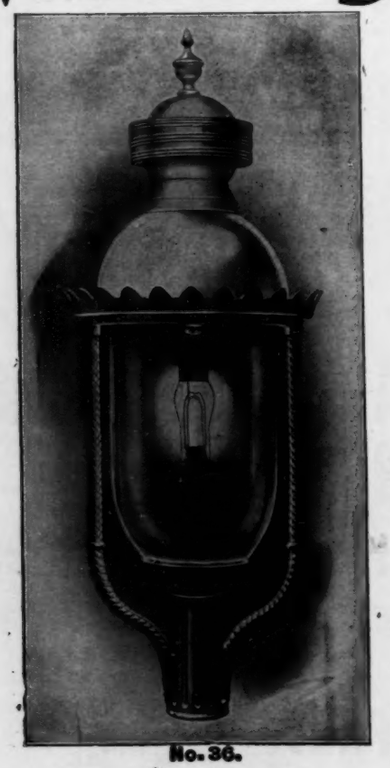

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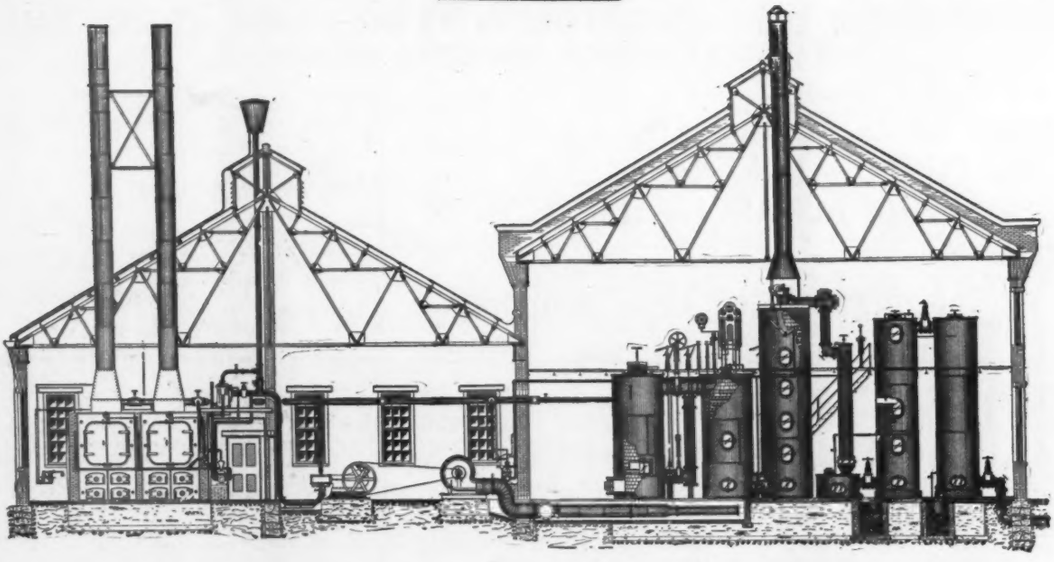

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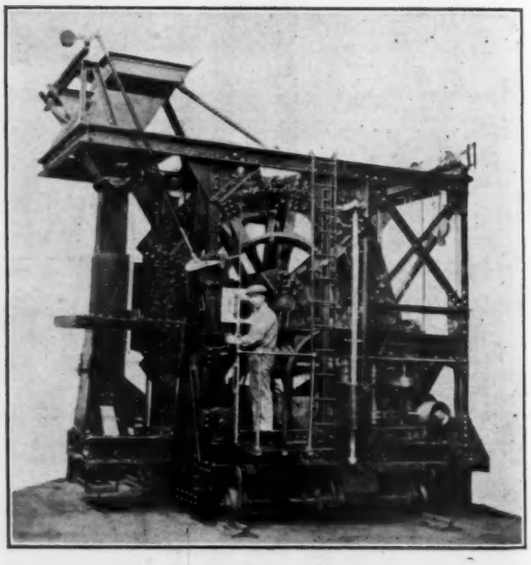

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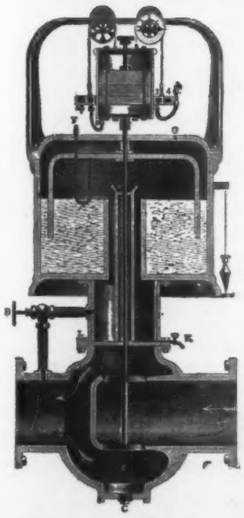

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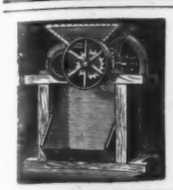

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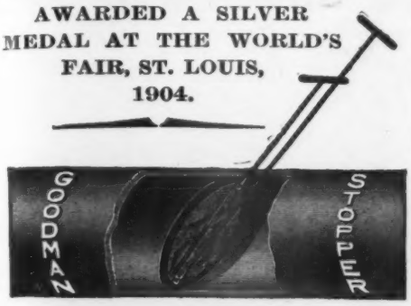

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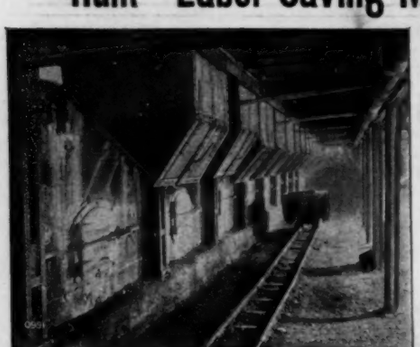

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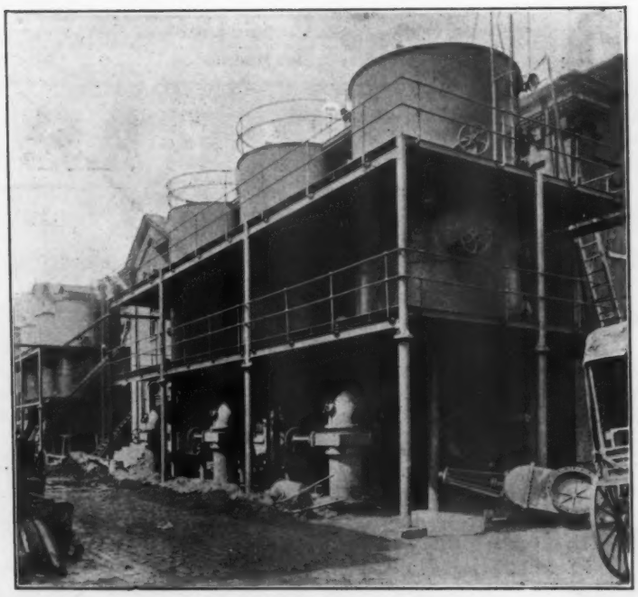

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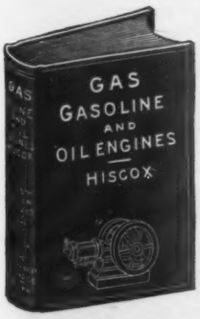

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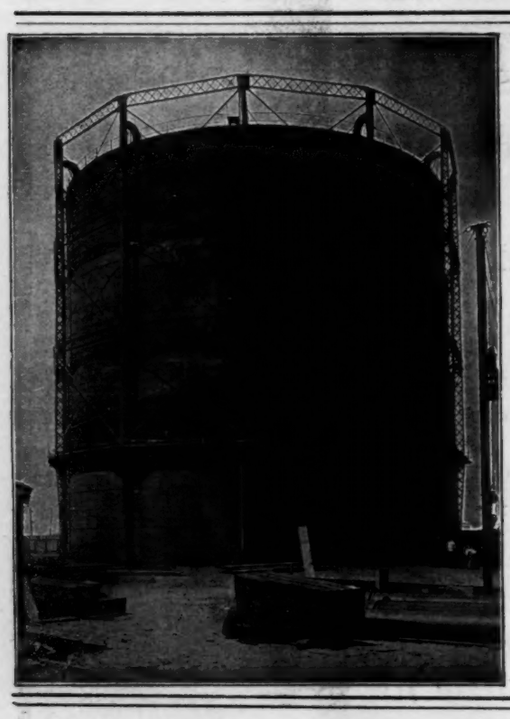

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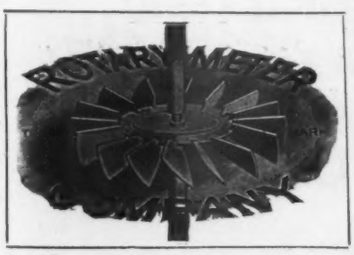

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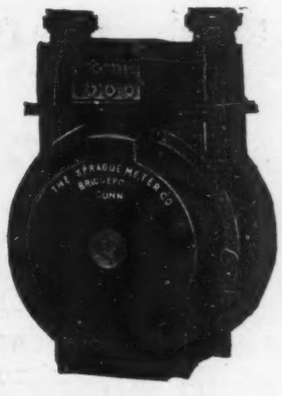

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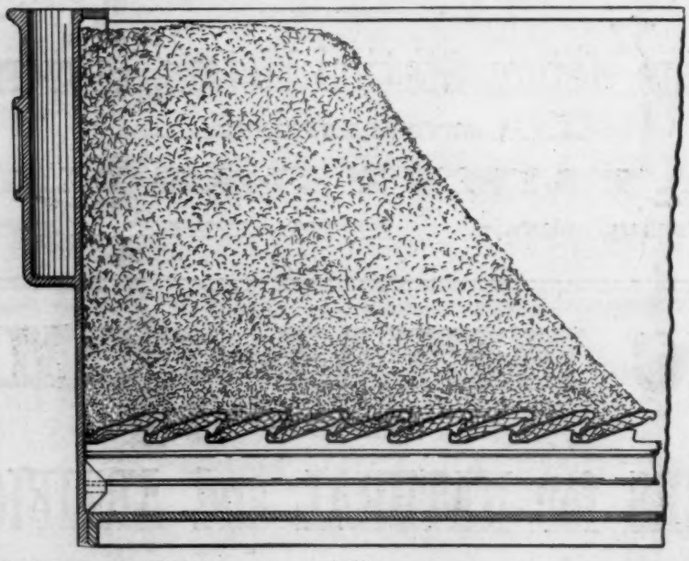

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